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Journal of the Society of Arts.

FRIDAY, MARCH 15, 1867.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings at Eight o'clock:—

MARCH 20.—“On Successful Oyster Culture.” By HARRY LOBB, Esq.

MARCH 27.—“On Flax, and Improved Machinery for its Preparation.” By CHAS. F. T. YOUNG, Esq., C.E., Memb. Soc. Engineers, Assoc. Inst. N.A.

CANTOR LECTURES.

A Course of Lectures “On Music and Musical Instruments,” by JOHN HULLAH, Esq., is now being delivered as follows:—

LECTURE III.—MONDAY, MARCH 18.

MUSICAL EXPRESSION.—Definition—Difficulties of Musical Composition—Realization of Unheard Effects—The Perfect Cadence—The Renaissance—Imitation—Expression, False and True.

LECTURE IV.—MONDAY, MARCH 25.

MUSICAL NOTATION.—Different Systems, Alphabetical and Special—Neumas—Accents—Lines and Spaces—The Time Table—Modern Notation; its Origin and Growth, Simplicity and Fitness.

LECTURE V.—MONDAY, APRIL 1.

MUSICAL INSTRUMENTS.—Classification—Wind Instruments—Stringed Instruments—The Plectrum, Hammer, and Bow—Instruments of the Ancients—Mediæval Instruments; their Introduction into the Church.

LECTURE VI.—MONDAY, APRIL 8.

MUSICAL INSTRUMENTS (*continued*).—Modern Instruments—Chamber and Orchestral—Combination—The Modern Orchestra—Conclusion.

The lectures commence each evening at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend to each lecture.

EXAMINATIONS, 1867.

In addition to the prizes announced in the Programme of Examinations, the following are offered:—

The Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, being employed in the coachmaking trade, obtain the highest number of marks, with a certificate, in those subjects respectively.

The Worshipful Company of Goldsmiths offer three prizes—of £5, £3, and £2 respectively—to the three candidates who, being employed on works in the precious metals in any part of the United Kingdom, shall obtain from the examiners

the first, second, and next highest number of marks, such prizes to be distinguished as the “Goldsmiths’ Company’s Prizes.”

SUBSCRIPTIONS.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed “Coutts and Co.,” and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

The Sub-Committee on Milk met on the 6th inst., at 10.30. There were present—Lord de l’Isle, in the Chair; Mr. Caird, Mr. Harry Chester, Mr. Clare S. Read, M.P., and Mr. Ludford White. The Committee settled the particulars of letters to be written to the following railway companies requesting information respecting the supply and transit of milk:—The Great Eastern, the Great Western, the South Eastern, the South Western, the London and North Western, the London, Chatham, and Dover, the London, Brighton and South Coast, and the Great Northern. Lord de l’Isle read a memorandum, drawn up by Mr. Sturgess, on the subject of cowkeeping for the working classes in the north of England; and communications on that subject were read from Mr. J. C. Morton, who was unable to attend the Committee, and others.

The Baroness Leisner-Ebersberg had sent a sample of “Liebig’s Concentrated Milk for Infants,” prepared for the “Infant Food Company” by Mr. Mullen. This preparation, she said, was stated by Professor Liebig to be a perfect chemical equivalent for woman’s milk.

Various other matters were discussed, and the Committee adjourned to Wednesday next, at 10.30.

The Sub-Committee on Meat met on Wednesday, the 13th instant. Present—Mr. Harry Chester, in the Chair; Messrs. C. S. Read, M.P., E. Wilson, F. Parish, C. Wren Hoskyns, James Ware, and J. Ludford White.

Samples of a large quantity of Australian beef, preserved by Mr. Tindal, were laid before the Committee. It was stated that this was now on regular sale, at 7d. or 6d. a lb., according to quality.

The following memorandum, by Dr. Thudichum, on the use of “Liebig’s Extract of Meat,” was read:—

Liebig’s extract of meat may be substituted for, or used in conjunction with, beef tea in the following manner:—A quantity of the extract, containing the soluble constituents of 2lbs. of fresh meat, when dissolved in three pints of boiling water, makes good strong beef tea. Salt has to be added to taste. Flavouring ingredients and

spices may also be added with advantage. Beef tea is ordinarily made thus: A quantity of meat (mostly from the leg of the ox), say 2lbs., is chopped or cut small, and put on with five pints of cold water. It is then heated to boiling, and the scum which rises taken off. It is further boiled down* to three pints, and the liquid strained from the meat residues. The latter are now in such a condition that human beings refuse to eat them, and cats and dogs will eat them only under the compulsion of great hunger, or with the addition of a little salt.

If 2lbs. of beef, or their soluble constituents in the shape of Liebig's extract, are used to make three pints of broth, a beef tea results, which is as strong as ought ever to be used. For some persons and some purposes the three pints may, with advantage, be diluted to four.

Liebig's extract is free from fat and gelatine; the beef tea made in our kitchens contains both. Careful cookery prescribes the removal of the fat from beef tea or gravy soup, but the gelatine is not by any means excluded. On the contrary, much of our gravy soup, or light thin soup so-called, consists of "stock," which is mainly a decoction of all kinds of bones resulting from culinary operations.

This gelatine adds a trifle to the nutritive value of the gravy, but injures its taste; it hangs gluey or sticky about the lips. It is the less objectionable the larger the proportion of actual extract of meat, or decoction of meat (real beef tea) that is mixed with it. It is by no means a necessary ingredient of good beef tea or gravy soup.

There is one clear gravy soup, containing gelatine only, known in the art of cooking, namely, the "soupe maigre," from the drum-sticks or tarsal bones of fowls, so pathetically described by Beauvilliers, in "L'Art du Cuisinier;" but this is actually only a curiosity.

If Liebig's extract contained fat it would not keep, but become rancid; if it contained gelatine, it would be impossible to estimate its value as compared to the best beef tea; for the best dry gelatine being only half the price of extract of beef, its admixture would depreciate the extract; and as the amount of gelatine in the extract would, or might be, variable, and could in no case be determined, the value of the extract would be uncertain, and it could not be bought or sold as it can now, by the standard of the meat-weight, which a given quantity of it represents.

In my opinion Liebig's extract will be more generally useful in the following cases:—

1. As an aid to cookery in houses of the middle classes, managed with intelligence.

2. As an aid to cookery in hotels and eating-houses of all descriptions.

3. As a ready means for producing quickly a nutritive, easily digestible, and tasty soup for great numbers of persons, under circumstances where elaborate cooking is impossible. Thus, for soldiers on the march, in camp, or even in barracks, for mariners on board ship, for patients in hospitals, for the recipients of charity in soup-kitchens, for the poor in workhouses and asylums, for prisoners in jails, and for children in schools, orphanages, refuges, &c., good soup can be prepared quickly by dissolving the necessary quantity of the extract in boiling water, and pouring this over bread, or toasted bread.

Any ordinary soup, made with water and with ingredients such as peas, rice, potatoes, &c., and even with lumps of meat, may be greatly improved by the addition of a suitable quantity of the extract. One teaspoonful of the extract dissolved in a quart of the ready-made soup, would make it of the same beef-tea strength as is ordinarily used in good household soups of the middle classes.

But the extract will probably remain inaccessible to the poorer classes in general, for the following reasons:—

(a.) Because the extract cannot be retailed con-

veniently in quantities adapted to daily wants, and because its viscid nature makes its sub-division and distribution, without material loss, very difficult.

(b.) Because in warm weather it has to be stored in a cool larder or cellar, to prevent it from becoming putrid.

(c.) Because its use presupposes a certain knowledge and intelligence on the part of the person charged with its preparation, without which great waste would be certain to result.

NOTE BY MR. HARRY CHESTER ON THE FOREGOING MEMORANDUM.

The extended use of *Extractum carnis*, as the beefy element of soup, may have an important bearing on the general question of supplying meat for the masses of the people; because the *Extractum* thus used is for the most part brought from South America and Australia, and is substituted for the British beef which would otherwise be consumed in the making of stock.

DEPUTATION TO THE ROYAL AGRICULTURAL SOCIETY.

A deputation from the Council of the Society of Arts, consisting of Mr. Harry Chester, Vice-President, Mr. D. Robertson Blaine, Mr. G. F. Wilson, F.R.S., and the Secretary, met a deputation from the Council of the Royal Agricultural Society, consisting of Mr. Thompson, the President, Mr. Dent, M.P., Mr. C. S. Read, M.P., Mr. S. B. L. Druce, with the Secretary, on Thursday, the 7th inst, in order to seek the co-operation of that Society in promoting the education of the working classes engaged in the cultivation of the soil.

Mr. Chester explained the system of examinations instituted by the Society of Arts, and said that the object the deputation had in view was to ask the Royal Agricultural Society to exert its influence for the improvement of primary education among agricultural labourers, and to induce the higher class of such labourers and mechanics to avail themselves of the advantages offered by these examinations.

After a conversation, Mr. Thompson expressed, on the part of the Council of the Royal Agricultural Society, their willingness to consider what could be done to aid the Society of Arts in this matter, and promised that the subject should receive their most favourable consideration.

Sir Thomas Phillips, Chairman of the Council of the Society of Arts, was prevented from attending by indisposition.

CANTOR LECTURES.

"ON MUSIC AND MUSICAL INSTRUMENTS." By JOHN HULLAH, Esq.

LECTURE II.—MONDAY, MARCH 11th.

MELODY, &c.

Mr. Hullah began his second lecture by referring to a statement he had made in the first—that music and noise, however different practically, were but degrees of the same thing. Something of the same kind is true of melody and harmony, seeing that no close consideration

* This boiling down is not necessary when Papin's digester is used. In that case the exact amount of water is added, and the pot closed.

of the nature and properties of the one is possible without continual reference to the other. No doubt it is convenient to distinguish them, but not to say that pure melody is impossible, seeing (as was shown in the first lecture) that a single sound can only exist for an instant, every melodious progression is good or bad in so far as it conforms to some principle of harmony, and every harmonious progression is good or bad in so far as the individual sounds of which it is composed move with freedom and propriety. A single chord is an example of harmony only, but when we follow it by another chord we introduce melody. He had often been asked, "Does a musician, in composing a song, for example, make the tune first and the bass and other parts afterwards, or how?" The process of musical, like every other kind of composition, is difficult to analyse or describe, but probably, whatever may be the practice with others, educated musicians always simultaneously conceive whatever is to be simultaneously executed; and some plan and finish large sections, and even whole movements, by a single effort. Mr. Hullah alluded to another statement he had made in his first lecture—that the presence of two notes of the natural scale was the characteristic of modern music; and that unless these two notes were found in occasional juxtaposition, no idea of a key or scale, in the modern sense of those words, was possible. Also, that music deficient in the juxtaposition of these two notes, whatever might be its other merits, was, in comparison with the music of our own times, of necessity indistinct in outline and pale in colour; and that the same thing was true, in some degree, of national melody, whether of ancient peoples, who had cultivated music scientifically, or of modern peoples, who had not. The idea of a scale or a key, is represented sufficiently for practical purposes by the word *tonality*. The music of the old masters differs from ours in many things, but more than all in tonality. But there is music differing from ours, not only in tonality but in system; the word "system" technically expresses the number and relation of the sounds between any given sound and its octave. In the modern European system the extreme number of these is thirteen, but other peoples have made a different division. In stating this, the lecturer did not take into account the savages concerning whose music some travellers have given us such exact information. When one of these tells us that the inhabitants of some island in the Indian Ocean habitually sing the third of a scale a quarter of a tone sharper than Europeans, we may reasonably demand evidence of his right to dogmatise on such a nice point. Musicians, highly gifted and highly practised, occasionally fail in their own intonation, and are mistaken concerning that of others. But, without reference to barbarians, it is certain that systems different from ours have been employed by nations sufficiently cultivated to expound them; their instruments would, in many cases, prove this. Mr. Hullah here compared (by the aid of diagrams) two or three oriental systems with our own. Melody, constructed on some of the former, certainly might give pleasure, after a time, even to us. But harmony, save within the narrowest limits, was, on any system but our own, inconceivable. Further demonstration (accompanied by illustration) of the nature of a scale, and its variety of modes, led to the conclusion that two conditions were essential to a melody, in order that its tonality might be unequivocal. (1.) That it include the fourth and seventh of a scale, and (2.) that it end on the key-note, or on a note of the triad of the key-note; *i.e.*, if a melody were in the key of C, it must include B or F, or both, and end in C, E, or G. Even these two last endings were of doubtful legality. Perhaps tonality depends more on ending on the key-note than on anything else; for there are many tunes the tonality of which, but for so ending, would be uncertain. The well-known tune, "Ye banks and braes of bonnie Doon" (whether English or Scottish it is needless to inquire), is a case in point. The first section of another Scottish tune, "Ca'd kail

in Aberdeen," presents another example. The fine air, "Roy's wife of Aldavalloch," is not only wanting in a fourth and seventh, but ends on a note not decisive of its tonality. It may be the third of a modern scale, or the final of an ancient one. "Hey tuttie tattie" ends on the fifth of the original key; one very obvious mode of harmonization would make it end in the key of the dominant of the original. Another tune, "Shame fa' the gear," ends on the sixth of the key in which it begins—its relative minor; thus, as was common in old tonality, beginning in one mode and ending in another. An instance of the exact converse of this is found in the Irish melody, "Arrah, my dear Eveleen," which began in A minor and ended in its relative major. Another characteristic of Irish, Scottish, and Oriental melody is the frequent introduction of the minor or flattened 7th of the tonic; as of B flat, supposing the tonic to be C. Two instances were given of this, the Scotch tune, "Baloo, loo, Lammy," and the Irish, "The old Lang o' lee." Mr. Hullah then called attention to a popular error, which had probably grown out of this omission of the 4th and 7th—that most national melodies are in a minor key. He had long believed that this was not the case, and had been gratified to find his opinion confirmed by Mr. Carl Engel, of whose "Introduction to the Study of National Music" he spoke in very high terms. Mr. Engel believed that the proportion of major to minor national tunes is at least as high as eight to one. The misconception arose from the frequent occurrence of the minor 3rd in what Mr. Engel called the "pentatonic" scale—that in which the 4th and 7th were wanting. To what causes could the anomalies that have been alluded to be ascribed? Mr. Hullah had expressed elsewhere considerable doubts as to the genuineness of many so-called ancient melodies—transmitted, as many of them had been, through long ages, from voice to voice, and from instrument to instrument, without the conservative influence of musical notation. He gave an instance, in which he was personally concerned, of very considerable alteration made in a song, sung from memory, during only a very few years. But, whether genuine or not, a vast body of melody exists which presents very peculiar, not to say anomalous, features. On the supposition that the melodies were originally vocal, many of these anomalies are unaccountable. There is nothing in the nature of the larynx which would suggest or necessitate imperfect scales; but with instruments the case is altogether different. Vocal music is always supposed to be anterior to instrumental. But is this supposition justifiable by reason or probability? History would seem to point to a different conclusion, seeing that the earliest mention of music is not in connexion with a singer, but with him who was "the father of all such as handled the harp and the organ." Few sounds in nature, perhaps none, are isochronous. No untaught bird maintains the same pitch in singing for more than an instant. Neither the wail of the wind nor the roar of the sea are isochronous. Who will undertake to express thunder in musical notation? But the simplest reed or cane is easily convertible into a musical instrument—if it be not one already, and almost any stretched string will give a musical sound. If instrumental be anterior to vocal music, many imperfect melodies may be of prodigious antiquity. But whichever of the two be the senior, both are pre-historic,—as are, possibly, the germs, at least, of many national melodies.

FOURTEENTH ORDINARY MEETING.

Wednesday, March 13th, 1867; GEORGE FERGUSON WILSON, Esq., F.R.S., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

De Vere, Albert, 86, St. James's-street, S.W.
 Ellis, E. S., The Newarke, Leicester.
 Elwes, V. Cary, Billing-hall, Northampton.
 Kirkbank, John, 10, Gray's-inn-square, W.C.
 Knowles, John, 42, Moorgate-street, E.C.
 Pearce, Joseph Salter, 18, Barnsbury-street, N.
 Potter, Edward, Marine-house, Tynemouth.
 White, Henry Hopley, Q.C., the Firs, Rectory-grove, Clapham, S.

The following candidates were balloted for, and duly elected members of the Society :—

Alsop, John Alfred, 22, Brunswick-square, W.C.
 De Salis, Colonel Rudolphe, C.B., 123, Pall-mall, S.W.
 Freeland, Humphry William, Chichester.
 James, W. H., 78, High-street, Camden-town, N.W.
 Kime, William Thomas, Louth, Lincolnshire.
 Leslie, Thomas Edward Cliffe, Union Club, S.W., and 22, Old-square, Lincoln's-inn, W.C.
 Marsh, William Robert, The Rice Mills, Bromley, E.
 Morgan, Fortescue J., Stamford.

The Paper read was—

THE TINNEVELLY PEARL FISHERY.

By CLEMENTS R. MARKHAM, Esq.

In bringing before a meeting of the Society of Arts the subject of the pearl fishery on the southern coast of India, I desire in the first place to disclaim all pretence to scientific knowledge, and to make it clearly understood that any special knowledge I may possess is merely derived from a careful attention to the subject during the last few years, and from a personal inspection of the Tinnevelly fishery grounds in the early part of 1866.

From time immemorial the pearl fishery in the narrow sea which separates Ceylon from India, has been famous in all the marts of the Old World, and has rivalled the renowned fishery of Bahrein, in the Persian Gulf. Opinions have always varied respecting the value of the pearls from these fisheries. Tavernier, the travelling jeweller, whose account of Persia is so well known to readers of old voyages and travels, said, in 1651, that the pearls from the sea that washes the walls of Manaar, in Ceylon, are, for their roundness and water, the fairest that are found, but rarely weighing more than three or four carats. Master Ralph Fitch, a London merchant, who made a voyage to the Indies in 1583, asserts, on the other hand, that though the pearls of Cape Comorin are very plentiful, they have not the right orient lustre that those of Bahrein have. Whatever the truth may be, touching the pearls of these rival fisheries, there can be no doubt that a vast concourse of merchants has been attracted to the Gulf of Manaar from the most ancient times, which is sufficient evidence of the value of the pearls. In later times the banks off Rio de la Hacha, Margarita, Cubagua, and Panama, in South America, have yielded large harvests of pearls; but the banks in the Persian Gulf and the Gulf of Manaar have been and still are the main sources of supply in the Old World.

The Ceylon fisheries have retained their reputation; but it is to the banks on the opposite side of the gulf of Manaar, off the shores of the collectorate of Tinnevelly, that I desire now to draw attention.

In the golden age of the Tamil people of southern India, the Tinnevelly pearl fishery paid tribute to the Pandyan kings of Madura. Its head-quarters, we are told by Ptolemy, were then at Koru, the modern Coilapatam. Marco Polo, in the end of the 13th century, mentions the land of Maabar, where many beautiful and great pearls are found off the coast. The merchants and divers, he says, congregated at Betalar in April and May; and he relates how the divers performed incantations to preserve them from the attacks of great fish in the depths of the sea. The shark charmer is still paid by the Ceylon Government for his attendance at the

fisheries. In those days the sovereign received a tenth, and the divers a twentieth of the proceeds of the fishery. The great abundance of pearls from the Tinnevelly fishery, and from that of the Ceylon coast, excited the wonder of all the bold wanderers from Europe who completed the perilous voyage to India in early times. Friar Jordanus, a quaint old missionary bishop, who was in India about 1330, says that 8,000 boats were then engaged in this fishery and in that of Ceylon, and that the quantity of pearls was astounding and almost incredible. Friar Odoric, who travelled at about the same time, says that in this land are found as great store of good pearls as in any part of the world. Old Ludovico di Varthema, the garrulous wanderer from Bologna, mentions having seen the pearls fished for in the sea near the city of Choyl, in 1500, or thereabouts; and his Portuguese contemporary, Duarte Barbosa, gives a more detailed account of the fishery. He says that "close to this island of Coulam, in the sea, there is a sand bank covered with 10 or 15 fathoms of water, in which a very great quantity of fine seed pearls are found, small and great, and a few pearls; and the Moors and Gentiles go there from a city which is called Sael, belonging to the King of Coulam, to fish for this seed pearl, twice a year by custom, and they find them in some small oysters, smoother than those of our parts."

The head-quarters of the fishery were then, and indeed from the days of Ptolemy to the 17th century continued to be, at Choyl, or Coyl, or Sael as Barbosa has it, literally "the temple." This place is, according to Dr. Vincent, the Kora of Ptolemy, the Kholki of the author of the Periplus, the Koil or Choyl of the travellers of the middle ages, and the Ramana Koil ("Temple of Rama") of the natives. This would place it on the sacred promontory of Ramnad, or the island of Rameswarum. But it is more probable that the true locality which was the head-quarters of the Indian pearl fishery from time immemorial, is to be found at or near the modern salt station of Coilapatam, on the coast between Tuticorin and Trichendoor.

Tuticorin, the present head-quarters of the fishery, has supplanted the ancient Coil for the last two centuries; and since the middle of the seventeenth century the agents of the powers that have successively directed the fishery, whether Portuguese, Dutch, or English, have uniformly taken their station at this little port. It is about 90 miles N.E. of Cape Comorin, on the Tinnevelly coast. The Naiks of Madura, the Telugu sovereigns whose family had succeeded the ancient Pandyan dynasty, were at the height of their power in the middle of the seventeenth century, and were lords of the Tinnevelly coast. These Naiks were the builders of all the magnificent edifices which now beautify the city of Madura, and their dues from the fishery were probably used as offerings to Minakshi, the fish-eyed goddess of the vast Madura pagoda, who now possesses amongst her jewellery a numerous collection of pearl ornaments. The Naik sovereigns had the proceeds of one day during the fishery, and when the Portuguese were powerful along the coast the Jesuits enjoyed those of another, whilst the owners of boats were entitled to one haul every fishing day. In those times there were 400 or 500 vessels at the annual fishery, and at the subsequent fair held at Tuticorin there was an assembly of from 50,000 to 60,000 persons. Captain Hamilton, who was travelling in the East from 1688 to 1723, described Tuticorin, when the Dutch were masters of the port, as well as of Ceylon. He says that a Dutch colony at Tuticorin superintended a pearl fishery a little to the northward of that port, which yielded to the Dutch East India Company a yearly tribute of £20,000.

The Dutch appear to have fished too recklessly and too often. On the Ceylon side, off Arippo, they fished from 1667 to 1768, with short intervals, their last fishery having been in 1768, after which year the banks had a complete rest until the first English fishery in 1796. On

the Tinnevely side the Dutch fisheries were also incessant, almost annual. After the English occupation of Tuticorin there was a fishery in 1822, which yielded a profit of £13,000 to the Indian revenue. Another in 1830 yielded £10,000. Between 1830 and 1856 there were 13 examinations of the banks, and on each occasion it was found that there was not a sufficient number of grown oysters to yield a profitable fishery, and none was attempted. Meanwhile the state of affairs on the Ceylon side was far more satisfactory. From 1796, the date of the first English fishery at Arippe, to 1809, the yield was £517,842; from 1828 to 1837 it was £227,131; and from 1855 to 1860, £117,153. In 1859-60, of the two principal Ceylon banks, the Modrigan yielded 12,000,000 and the Cheval-paar 60,000,000 shells.

The unsatisfactory condition of the Tinnevely banks, from the year 1830 to 1856, has been attributed to various causes. Captain Robertson, the late master-attendant at Tuticorin, thought that the widening of the Paumben channel, which has caused a strong current to flow over the banks, prevented the molluscs from adhering to the rocks; and that the boats employed in fishing for large shells, called *chanks*, killed the pearl oysters by anchoring on the banks; while the native divers attributed the state of the banks to the pernicious influence of two other bivalves, called *soorum* and *kullikoz*.

In 1856, however, an examination made by Captain Robertson proved very satisfactory, and four banks off Tuticorin, called the Cruxian-paar, the Nagara-paar, the Oodorooovee-paar, and the Klatee-paar were found to be well covered with young oysters, which would be old enough to be fished in 1860-61. The Madras Government, therefore, determined that every precaution should be taken, in order that the banks might receive no damage in the interval. Vessels were provided to protect the banks from poachers, and the chank fishery was ordered to be put a stop to at the termination of the contract. Captain Robertson was, unfortunately, lost in an unseaworthy pattamar, which had been obtained from the Bombay Government in March, 1859. He was succeeded as master-attendant and superintendent of the Tinnevely pearl banks by Captain Phipps, to whose zeal and intelligence the fishery owes its present hopeful condition, and under whose auspices the fishery of March, 1860, the first that had been attempted since 1830, was opened.

The fishery of 1860 commenced on March 7th, and the sale of the Government share of oysters was conducted by public auction, which began at 15 rupees, and gradually rose to 40 rupees per 1,000. As many as 15,874,500 shells were sold, realising upwards of £20,000 as the net result to Government, exclusive of all expenses and of the shares allowed to the divers. In 1861 the results of the fishery were equally satisfactory, but in 1862 the banks were found to be in a most unpromising state, and no fishery was attempted. Out of 72 banks that were examined, only fourteen had oysters on them, and 57 were blank. The subsequent examinations were still more unsatisfactory, until the beginning of the present year, when Captain Phipps reports having found an immense quantity of pearl oyster fry on four of the banks off Tuticorin, namely, the Cruxian-paar, the Nagara-paar, the Klatee-paar, and the Atawae Arupagam-paar.

I will now proceed to give some account of the pearl oyster, and of the establishment forming the Tinnevely Fishery.

It is, perhaps, unnecessary to observe that the pearl oyster is not in reality an oyster at all, being more allied to a mussel. It has, like the latter animal, a *byssus*, or cable, by which it secures itself to the rocks, one of the most important points in its organization. When the animal desires to attach itself to a rock, its foot is protruded, and, after seeking out a suitable spot with the tip for some minutes, is again retracted into the shell. A strong fibre, of the form of the groove in the foot, is left attached to the base of the foot at one end and to

the rock at the other. The process is again and again repeated until a strong cable is formed; and the animal is able to throw out a fresh *byssus* whenever it is broken by removal or other accident. The formation of pearls is a point which has long puzzled scientific men, and the subject received very minute attention from Dr. Kelaart in the course of his investigations at Trincomalee. Pliny and Dioscorides believed that pearls were the productions of dew; but that observant old Elizabethan navigator, Sir Richard Hawkins, shrewdly remarked that "this must be some old philosopher's conceit, for it cannot be made probable how the dew should come into the oyster." Modern research has suggested various causes for the intrusion of the nucleus round which the pearl is formed. Dr. Kelaart has suggested that the ova which escape through the distended coat of an overgrown *ovarium* may become imbedded in the interstices of the mantle and form nuclei of pearls; or that the siliceous internal skeletons of the diatomaceæ which form the food of the pearl oysters may serve a similar purpose. But Mr. Gwyn Jeffreys, in his report to the Secretary of State for India, informs us that "pearls are produced in consequence of the irritating tenacity of minute parasitic crustacea that adhere closely to the outside of the mantle of the pearl oyster. In order to get rid of these troublesome intruders the pearl oyster smothers them with a coating of nacreous matter, of the same description as that which lines the inside of its shell; and the gradual superposition of layer upon layer in concentric order results in the formation of the much-prized ornament. Its shape depends upon that of the nucleus. The parasites are of different kinds, some being spherical, others oval, and occasionally lying so close together as to make the pearl double or irregular. That the nucleus of the pearl ever consists of a grain of sand, or of the food of the pearl oyster, seems to me physically improbable. Any loose adventitious matter, such as sand, would be immediately removed by the continued action of the mantle, which is thickly covered with *cilia*. The food cannot find its way to the outer coat of the mantle through the wall of the stomach, as Dr. Kelaart imagined; and even if it got there it would not remain. Pearls are invariably found between the mantle and the inside of the shell."

The pearl oyster banks, which are very numerous, lie off Tuticorin and Trichendoor, and are about six to eight miles from the shore, and from five-and-half to eight-and-half fathoms from the surface. Each bank has a name, by which it is known to the divers. They consist of masses of rocky ground, rising in patches from the sandy bottom, and are probably exposed to ocean currents, which, by washing sand into the interstices of the rocks, often destroy the young oysters over a considerable area. The dead fish soon contaminate their neighbours; and, in addition to this danger, the pearl oysters share the banks with other inhabitants, some of which are undoubtedly pernicious to their well-being. Amongst bivalves, the most common are a large *pinna* (called by the natives *arkoe*), a *modiola* (called by the natives *soorum*), which is a sort of mussel with a swelled face, and an *avicula* or swallow-tail (called *kullikoz*). The divers believe that the two latter are very injurious to the pearl oysters, but Mr. Gwyn Jeffreys does not think that this can be the case. "They may," he says, "by congregating in too large numbers, choke the pearl oysters, like weeds in a garden; but the food of all is the same, namely microscopic animalculæ, and there is plenty of it." The pearl oysters, however, have a really formidable enemy in the great chanks, a sort of whelks (*Turbinella rapa*), which are used as horns in the worship of idols, and cut into segments of circles as bracelets for women's wrists. The chanks, when they get a chance, drill small holes, by means of their proboscis or tongue, in the shell of the pearl oyster, and then feed upon the mollusc; but it is asserted at Tuticorin that, while the pearl oysters live on the rocks, the chanks are generally found on the sand. The chank

fishery at Tuticorin was, at the time of my visit, leased to a Mr. Barter, at the rate of £25 a canoe for the season, of which he employed nine. They started at early dawn from the chank godown, about half a mile north of the town, and sailed out in a line, for a distance of some three or four miles, returning at dusk. The trade in chanks is almost entirely with Calcutta, and their price, formerly twelve rupees, was then only six rupees per hundred. There are also large starfish on the banks, of a white colour, picked out and fringed with bright crimson. Mr. Gwyn Jeffreys recommends the destruction of chanks and starfish whenever they are found on the banks, just as vermin are destroyed in a game preserve.

The pearl fishery has been conducted, from time immemorial, by a caste called Parawas, who are met with along the Tinnevely coast, from Cape Comorin to the Paumben channel. They were all converted and baptised wholesale by St. Francis Xavier, and are now Roman Catholics, the ancient church at Tuticorin being the freehold of the caste. The headman of the caste, an hereditary office, is called the Jadi Talaven; he has a good house, built in the Dutch times, with portraits of former Jadi Talavens; but the present man spent £1,000 on his daughter's marriage, and is now heavily in debt. The Parawas drink very hard, but there is no thieving or other crime among them, and they are capital boatmen as well as divers. The divers age very fast, and all look old and withered men, from exposure and drink. They cross themselves before plunging into the water; and I was told that the longest time that any of them has been known to keep under is one minute and eight seconds. They get a rupee a day in ordinary times.

When a fishery is announced to take place, one thousand pearl oysters are got up, opened, and put into a canoe, where the whole product of pearls is collected. This is considered as a sample of the fishery, and the pearls are submitted to the inspection of the most experienced pearl merchants, who class them on a fixed principle. The classification is as follows:—

1. *Anie*, pearls of perfect sphericity and lustre.
2. *Anathorie*, failing in one of the above two points.
3. *Masengoe*, failing slightly in both points.
4. *Kalippo*, failing still more.
5. *Korowel*, or double pearls.
6. *Peesal*, or misshapen pearls.
7. *Oodwoe*, beauty.
8. *Mandangoe*, bent or folded.
9. *Kural*, very small and misshapen.
10. *Thoot*, seed pearls.

The number of each class found in the sample is then published, on the authority of the experts, and this establishes the price of the shells at the outset, but the price fluctuates afterwards, according to the frequency of the prizes that are subsequently drawn. Tavernier mentions the same practice in 1651. He says that "in the eastern seas, before they fish, they try whether it will turn to any account, by sending seven or eight boats to bring 1,000 oysters each, which they open, and if the oysters per thousand yield five *fanos*, or above, then they know the fishing will turn to account." In 1861, the price began at 70 to 80 rupees per 1,000 shells, and afterwards sank to 40, 20, and 17 rupees. The fishery was held on the beach, about two miles north of the town of Tuticorin, at a place called the "Silawatooree," a Tamil word, meaning a fish-market. The shells were sold on large chunamed platforms, called *kottoos*, and hundreds of huts, with a few bungalows, surrounded the market, and formed a busy and very exciting scene.

Since 1861 there has been no fishery, and the attention of Captain Phipps has been unremittingly turned to the improvement of this interesting source of revenue. He is allowed a small establishment to guard and examine the banks. Two small schooners, the *Emily* and the *Edith*, were sent to Tuticorin in 1860, but the latter is now stationed at Paumben. The *Emily* was built at

Cochin, of teak, with copper fastenings, 54 feet long, and 35 tons burden. There is also a little teak-built cutter, of 19 tons, called the *Pearl*. In 1865, a steamer called the *Godavery*, built for the navigation of that river, was sent to Tuticorin. She is of iron, of 80 tons burden, with an engine of 25 horse-power, and draws 3 feet; but she is flat-bottomed, and quite unfitted for sea service. The establishment costs 300 rupees a month for the six months during which the season lasts, and the vessels are daily out on the banks; and for the rest of the year the skippers of the *Emily* and *Pearl* get 20 and 15 rupees a month respectively. This very trifling outlay has hitherto sufficed for the examination and guarding of the pearl banks.

A Government pearl fishery is a most legitimate source of revenue, and forms an exception to other monopolies. Pearls are simply articles of luxury, in the strictest meaning of the word. The seas in which they grow cannot well become private property, and, if a profit can be derived from their sale, it is certainly a source of revenue which can give just cause of complaint to no man, while it benefits the community at large. In India, too, the Government are possessed of advantages which enable them to get the work of superintendence and management done with far greater economy and efficiency than could be secured by any private individual or company. So high an authority as Mr. McCulloch has taken an opposite view, and says that the Government monopoly ought to be abolished, because the expense of guarding and managing the banks exceeds the sum for which the fishery is let, and because anyone who likes should be allowed to fish on paying a moderate license duty. The edition of the "Commercial Dictionary" from which I quote was published in 1860, and during the two following years the Tinnevely Pearl Fishery yielded a large net revenue to the state. This is a sufficient answer to Mr. McCulloch's argument. It is true that there has been disappointment; but the way to secure regular annual returns is to adopt a carefully-considered system of conservancy, and not to throw the fishery open to the depredations of all comers.

The precarious and uncertain condition of the Tinnevely Pearl Fishery may be attributed, as it seems to me, to the reckless and improvident fishing of former times, and to the absence of a scientifically organized system. It is a very old story. A valuable product is discovered to be a source of considerable wealth, and forthwith a system of reckless destruction for the sake of immediate gain is inaugurated. Then the supply begins to fail, a panic ensues, and, when science and forethought are called in, it is discovered that ordinary prudence and a judicious system of conservancy would have ensured a regular and unfailing yield from the first. Such has been the history of the chinchona bark in South America, of the teak timber in the Malabar forests, and such, I suspect, is the secret of the unsatisfactory condition of the Tinnevely Pearl Fishery since the Dutch times.

Indeed the same general principles will probably be found to be applicable to forest conservancy, and to the management of a pearl fishery. As a nursery of young trees forms an essential feature of most forest systems, so, as it seemed to Captain Phipps, a nursery of young pearl oysters would serve to replenish the pearl banks; and this idea was confirmed by a study of the method adopted with regard to edible oysters on the English and French coasts. The chief external difference between the pearl and edible oysters, is that the former secures itself to rocks and stones by means of a *byssus*, while the latter merely lies flat on the ground on its convex side; but there does not seem to be any ground for doubting that the pearl oyster might also thrive on artificial banks. In the Colne oyster fishery, the *brood* (i.e., oysters two years old) is dredged up out at sea, and placed on *layings* within the River Colne. These layings are generally dry at low water, and they are paved with stones, old shells, and any other hard substances, to the depth of a few inches, so as to form a bed for the oysters, which would

otherwise be choked in the soft mud. This material is called *culch*. The culch must be kept perfectly clean and clear of mud, and every mussel shell must be weeded out, because they have a tendency, from their shape, to cause accumulations of mud. The oysters remain on the layings for two years, when they are fit for eating; and during this time there are constant examinations, in order that all dead fish and mussels may be removed, and the culch kept clean. In places where the layings are never laid bare by the tide, this is done by means of a dredge. All live oysters and culch are carefully thrown back, while dead fish, mud, star fish, mussels, and whelks are removed.

It seemed to Captain Phipps (a view in which I entirely concurred) that some such system might advantageously be tried at the pearl fishery; especially as Dr. Kelaart had previously ascertained that the pearl oyster is more tenacious of life than any other bivalve with which he was acquainted, and that they can live in places so shallow as to be exposed, for two or three hours daily, to the sun, and other atmospheric influences.

The following measure has, therefore, been sanctioned, for the formation of a pearl oyster nursery:—

The harbour of Tuticorin is formed by the Devil's Point, to the southward, and a reef, with two small islands, called Punnayudde-teevo and Paundian-teevo, to the east. Lat. $8^{\circ} 47' 17''$ N.; long. $71^{\circ} 14' 19''$ E. To seaward, in strong breezes, the surf breaks along this reef, in 12 ft. of water, but between the islands and the mainland there is good shelter. Large vessels, coming for cotton, coffee, and senna, are obliged to anchor outside the Paundian-teevo, at the north end of which there is a lighthouse; but there is snug anchorage for small craft inside, and close to the town of Tuticorin. Between the Paundian-teevo and the mainland there is a bank, with a depth of from 3 to 7 feet, entirely free from surf, currents, and influxes of fresh water. Captain Phipps has selected this bank for the site of a pearl oyster nursery. A parallelogram has been enclosed with walls 450 ft. long, 8 ft. wide at the bottom, decreasing to $5\frac{1}{2}$ ft., and 10 ft. high. These walls are composed of blocks of coral, and strengthened by rows of palmyra piles. There is to be a small bungalow at the western corner. At the centre of the eastern wall an opening 8 ft. wide is left, to be closed by wooden gates. The intention is to have the floor lined with blocks of coral or of rock, as culch; and to stock the laying thus formed with pearl oysters about two years old. The nursery was commenced in November, 1864, and completed in the end of 1865. When the act of spawning takes place, the fry will be caught on culch, prepared for the purpose, and allowed to grow until the young oysters are large enough to be removed to the deep-sea banks. The same plan will be followed in each succeeding year. The removal is necessary, because it would be impossible to enclose an artificial space large enough to hold as many grown shells as are required for a remunerative fishery, and because it is believed that the quality of the pearl depends on the depth and clearness of the sea in which it is found. This, however, requires proof. A single pearl oyster, 5 or 6 years old, often contains no less than 12,000,000 eggs, and in the fishery of 1861 the total number of shells taken only amounted to 15,847,500, so that the number of young molluscs annually obtained from the nursery will, no doubt, be abundantly sufficient to stock one or more of the banks. In the fishery of 1861, the two best banks, namely, the Putta-marikan-paar, and the Nagara-paar, yielded 5,862,000 and 4,798,000 shells respectively, producing 128,666 and 52,771 rupees. It is during the period of early growth that the pearl oysters are most exposed to danger on their native banks; and, at all events, the nursery system will ensure to them a much briefer exposure to such dangers, while it will provide against such complete denudation of the banks as has been so frequent of late years.

Of course the nursery is an experiment, but it appears to be one which is well worth a trial. Two objections have been raised to its success by men who are personally acquainted with the locality. It has been urged—first, that the sun will kill the molluscs in only five feet of water; and, secondly, that instead of one opening there ought to be several, allowing a free flow of water. With regard to the first objection, Mr. Gwyn Jeffreys says that “the pearl oyster thrives best in clear water, the depth being immaterial.” “I am not aware,” he adds, “how far the influence of the sun's rays can penetrate the water in tropical seas; but I do not believe it would prejudicially affect molluscan life.” To the second objection it may be replied that the ebb and flow of the tide through the single opening, which is about 15 inches, will cause a sufficient movement of water, and that if not, other openings can easily be made.

After the nursery was completed Captain Phipps was met by the very serious difficulty of a total absence of pearl oysters for stocking it. The Tuticorin and Trichendoor banks were found to be quite blank. On the 25th of November, 1865, I spent the day on board the *Emily* over the Cruxian-paar, which is about four miles outside the Paundian-teevo light-house, and used to be considered one of the best banks. Divers went down several times, and there was a dredge overboard, but not a single live pearl oyster was brought up. There were several dead ones, together with pinnae, aviculae, purple sea-urchins, starfish, chanks, and pectens. The same result attended the examination of all the other Tinnevely banks, and an equally unpromising state of things existed on the Ceylon side during the season of 1865-66.

Under these circumstances I strongly recommended that a supply of pearl oysters for stocking the Tuticorin nursery should be obtained from the Persian Gulf. Both Professor Huxley and M. de Broca (who has conveyed live molluscs from the United States to France in large quantities) consider that it would be quite feasible to convey pearl oysters from Bahrein to Tuticorin; and Mr. Gwyn Jeffreys has recommended that a supply of brood pearl oysters be procured from the Persian Gulf, and says that they could easily be transported alive in wells, such as are constructed for bringing cod-fish and lobsters to Billingsgate.

Soon after I made this recommendation, Colonel Pelly, the political resident in the Persian Gulf, sent me his interesting report, dated December 15th, 1865, on the Bahrein pearl fishery, which enables me to give a few particulars respecting it; premising that it has been previously described by several old writers, and in 1853 by Colonel Wilson. Colonel Pelly's is, however, the most recent account.

He says that the pearl banks along the Arabian coast of the Persian Gulf are the property of the Arabs in common, but no foreigner is allowed to fish them. The richest are those of the island of Bahrein, which are found at all depths, from a little below high-water mark to eighteen fathoms. It is believed by the Arabs that the lustre of the pearl depends on the depth of the water, and the best oyster beds are said to be level, and formed of fine whitish sand overlying the coral, in clear water. The fisheries have taken place annually from the most remote times, without any sign of diminution in the supply; and about 1,500 boats are employed in them, which belong to Bahrein alone. The profit is about £400,000 a year, and the bulk of the pearl harvest is sent to the Bombay market, the rest to Bagdad. Colonel Pelly concludes his report by suggesting that a few hundred pearl oysters from Bahrein might be sent to the Gulf of Manaar, as an experiment.

While my proposal, that the Tuticorin nursery should be stocked by pearl oysters from the Persian Gulf, was under consideration, it became known that Mr. Holdsworth, the naturalist employed by the Ceylon Government, had found 30,000 pearl oysters on a bank near Mundi-teevo, on the Ceylon coast, and permission was given to take up 10,000 for the Tuticorin nursery.

Afterwards some more were found near Paumben, and on the banks off the Madura coast; and last January Captain Phipps made the welcome discovery already mentioned, that four of the banks off Tuticorin were well stocked with young oysters. The sea-weed that was brought up was found to be covered with fry, and Mr. Gwyn Jeffreys, to whom I forwarded a small parcel of it for inspection, has pronounced it to be fry of the pearl oyster.

Thus, the difficulty of stocking the banks and the nursery is, for the present, at an end, but it will probably be five or six years before the oysters will be sufficiently matured to allow of a profitable fishery. Meanwhile, the experiment will proceed in the nursery, and six large aquaria, with the necessary apparatus, microscope, and instruments, have been sent to Tuticorin, to furnish Captain Phipps with the means of watching the habits of the pearl oyster. A suitable room is now in process of erection for their reception.

Such are the measures that have been adopted with reference to securing an unfailing stock of pearl oysters for the fishery. The next point of importance is to attend to those rules of conservancy which are, as it seems to me, applicable alike to forests which clothe the mountains and to pearl banks which line the bottom of the sea. In the cork woods of Catalonia, for instance, the cork is taken from the same tree every eighth year. The plantations are, therefore, divided into eight sections, and one of these forms the harvest for each successive year. The same system will yield a highly remunerative return to the Government and other owners of chinchona plantations in India. In like manner, if the pearl oyster reaches maturity in six years, the banks might be divided into six sections, one of which would form an annual source of supply for a profitable fishery, and the stock might be kept up, with the assistance of the nursery. It would appear, from recent experience, that there are about two fisheries, yielding a net profit to Government of £40,000 every ten years, equivalent to a return of £4,000 a year, but coming in at very uncertain intervals. There seems to be no reason why this state of things should not be so far improved, by a system of scientific and carefully matured conservancy, as that the pearl fishery should be made to yield a regular annual return of £10,000 a year, at least, to the Indian revenue, so long as a demand for pearls continues to exist.

A very essential part of the duties of the superintendent will be to watch the banks every year, and carefully to examine their condition as often as possible. Mr. Gwyn Jeffreys has recommended that the banks should be dredged frequently, for the purpose of destroying the chanks and other noxious shell-fish, with their spawn, as well as the star-fish, the pearl oysters being carefully replaced; that systematic dredging should be carried on in the deeper water, for purposes of exploration, and to discover new pearl banks; that a steamer should be used for dredging and guarding the banks; and that a supply of pearl oysters should be obtained from Bahrein.

The provision of a steamer is a recommendation of the greatest importance. As diving operations must necessarily be conducted during calm weather, sailing vessels are of very little use for examining the banks, and the river steamer *Godavery*, already mentioned, is equally unsuited for such service. She is flat-bottomed, burns a ton of coal per hour, goes about four knots an hour, rolls tremendously, and, when there is any sea on, is positively dangerous. One superintendent has already been lost by providing him with an unseaworthy craft, and such a calamity must not be allowed to recur. The proper kind of vessel for service on the pearl banks would be an iron screw steamer of 40 tons burden, sixty feet long, by 15 broad, drawing five feet, and fitted with a screw propeller and engine of 10-horse power. Such a vessel could be provided for the comparatively insignificant cost of £1,700; and it is to be hoped that, before long, the Government will decide upon furnishing

the superintendent with this very essential means of performing his duties on the pearl banks.

It will have been seen, by a consideration of the points which I have endeavoured to explain, that the possibility of so far improving the Tinnevely Pearl Fishery as to ensure an annual supply of oysters, yielding a net profit to the State, depends upon the success that may attend our measures, first, for furnishing adequate supplies for stocking the banks; secondly, for husbanding that stock; and, thirdly, for the conservancy of the banks.

The measure which I have advocated for securing supplies for stocking the banks is that originated by Captain Phipps, namely, the rearing of pearl oysters in an artificial nursery. It is true that the success of this experiment is considered doubtful by Mr. Gwyn Jeffreys, Professor Huxley, and other very high authorities, but, at the same time, there do not appear to be stronger reasons to expect disappointment than are attendant on every new experiment, and this one is certainly worth a trial. Under any circumstances, when the natural supply fails, the banks can be stocked from other localities. The husbanding of the stock will be attained by a careful attention to the rule that the pearl oysters are never to be fished until they have reached full maturity; and if they are of different ages on different banks, an annual fishery will be insured. Lastly, the measures of conservancy embrace a frequent examination of the banks, and the destruction or weeding out of everything that is detrimental to the growth and well-being of the pearl oysters.

In conclusion, I cannot refrain from an expression of my conviction that if success is possible, it will be attained by the present superintendent, Captain Phipps, whose zeal, energy, and fertility of resource have already been so beneficially exerted. The Tinnevely Pearl Fishery could not, I am well assured, be in better hands.

It is with much diffidence that I have ventured to address this Society on so interesting and important a subject, because my want of accurate scientific knowledge renders it impossible that I should have done it justice. I trust, therefore, that it has been fully understood that I only profess to have given the results of a personal inspection of the fishery ground, and of some previous and subsequent study of the subject.

DISCUSSION.

The CHAIRMAN, in inviting discussion on the paper, mentioned that there was one enemy of the pearl oyster which Mr. Markham had not alluded to, and which he was informed was considered in Ceylon to be a very formidable one—that was a large fish of the skate species, which was supposed to eat the oysters, shell and all.

Mr. WRIGHT inquired whether he had rightly understood Mr. Markham to say that, as far as Ceylon oysters were concerned, the pearls were found in the body of the oyster, and not in the shell.

Mr. MARKHAM replied—Always between the mantle and the shell.

Mr. WRIGHT remarked that in the shells from the Persian Gulf, and those from the Arru Islands, south of New Guinea, the pearls were found occasionally in the nacreous part of the oyster, or what was commercially known as mother-of-pearl. The natives, when the oysters were collected, generally drilled a hole in the mother-of-pearl or shell, or broke it up to get out any real pearls there might be in it, but occasionally they missed one, and he recollected, about ten years ago, a workman in Birmingham found, in one of the shells he was employed upon, a very large and perfectly-formed pearl, which he disposed of for £40, and it was afterwards resold for £200. Small pearls were frequently found in this way, some perfect, and others only of partial formation. In the instance he referred to, the pearl was perfect in form, and of the shape and size of a small damson.

Mr. FRANK BUCKLAND had listened with great interest to Mr. Markham's able paper on a subject on which, comparatively, little was known in this country. During the last seven years there had been a similar failure of the oyster crops in England to that which had been mentioned with regard to the pearl oyster banks; indeed, there had hardly been any crop at all in England. He thought they ought to consider very seriously the cause of this failure. The reasons given by Mr. Markham were, that the oysters were either destroyed by the chanks or the star-fish, but he (Mr. Buckland) was of opinion that the failure of the crop of pearl oysters, as also of the English oyster fisheries, was due to larger causes than those mentioned by Mr. Markham. They had been told that as many as 12 millions of eggs were found in a single pearl oyster. The English oyster had as many as 800,000 eggs. Yet where were all the young oysters? There must be some greater causes of destruction of the young brood than those mentioned in the paper. He believed it was because there had been no "fall of spat," and that remark applied, particularly during the last three or four years, to the whole of the oyster fisheries of the British Isles, extending to Ireland. He was delighted to hear that a project for the artificial cultivation of the pearl oyster had been taken up. The success of that undertaking would depend very much upon supplying to the young oysters the conditions which they required. The young oyster brood required, in the first place, to be kept in a state of tranquillity, and to be protected from currents of water, as a very slight current was sufficient to waft them to a distance from the parent bed. That, he thought, to some extent accounted for the new beds discovered by Captain Phipps. He (Mr. Buckland), therefore, highly approved of the proposed plan of impounding the young brood in the situations in which they were found. The heat of the sun, where the beds were in shallow water, would, he thought, occasion no difficulty; for, if the pearl oyster was anything like the English species, the young brood were best developed under a considerable amount of solar heat; it was only the older fish which required to be shifted into deeper water. The tanks on which the oysters for breeding were deposited should, in his opinion, be protected as much as possible from the action of the tide. If that were not done there was danger of the young spat being carried away. He entirely approved of the system of dredging referred to in the paper. He would ask what was the depth of water over the bank. [Mr. MARKHAM replied about seven fathoms.] That, Mr. Buckland said, might be a practicable depth for efficient operations with the dredge. He also agreed with the system of "culling" the crop, and distributing the oysters, according to their growth. That was the plan adopted in England; and thus each year in turn produced its matured crop of oysters. The dredging would do no harm to the young pearl oysters, because they would soon form a new byssus. He did not very well see how dredging could be carried on by means of a steamer, especially one with a screw, as there would be a difficulty in using more than one dredge at a time, whereas four or more were sometimes put out together. As all the dredges would drift in the same direction, there was danger of the drag ropes getting foul of the screw. He very much preferred dredging with a sailing vessel. He quite agreed with the admirable remarks in the paper with respect to the reckless destruction of the oysters. It almost made him weep to hear of it. He called it murder to take little oysters not bigger than half-a-crown, which in a few years would have come to maturity, and have fetched a large price in the market. Reverting to the many destructive influences to which the young brood of pearl oysters were exposed, it occurred to him that a sandstorm might cover them over and destroy them; a sudden irruption of cold water from the bottom, or an influx of snow water from the land, might have the same effect; and, moreover, in tropical climates an oyster bank might be destroyed by submarine volcanic action. He did not think so much of the

ravages of the skates mentioned by the chairman, as they must have a very voracious appetite to eat up a bank of oysters seven miles in extent. When one bank was exhausted, the managers should look out for another, and by means of the dredge follow up the young broods, who, in some degree, resembled swarms of bees, who did not usually travel very far before they alighted in search of fresh quarters. The dredging was also beneficial in preventing the oysters from being killed by the superposed weight of too large an accumulation at one spot, and in killing the star-fish, or "five fingers," the greatest vermin on an oyster farm.

Mr. GWYN JEFFREYS (responding to the invitation of the chairman) said, with reference to what Mr. Buckland had stated on the subject of dredging from steamers, he doubted whether that gentleman had had much experience in that operation; he (Mr. Jeffreys) had dredged for six weeks together with a steamer in the Shetland Isles, and constantly kept two dredges at work at a depth of from 80 to 100 fathoms. He found that method of dredging was by far the best for scientific exploration, and it would be equally so for such valuable products as pearls and oysters. In his opinion there was nothing like a steamer for dredging. They could regulate the speed as they pleased, and the results were far more satisfactory than with sailing vessels. The steamer he used had paddles, but it made very little difference whether a paddle or screw was used. The observations of the first speaker as to the formation of pearls in the nacreous or inner layer of the pearl oyster were quite correct; imperfect pearls were often found in that position. He did not think they would be of much commercial value, because they were not spherical, but contrivances were adopted for cutting off the irregularities, so as to improve the appearance of the pearl. The observation of the chairman, with respect to the destruction of the pearl oysters by a fish of the skate species, was important, and he was himself inclined to rank this fish with the tribe of star-fish and whelks and other natural enemies of the pearl oyster; but, by dredging and carefully watching the banks, he thought this skate might be destroyed, as well as, to a great extent, all the other vermin, so to speak, which had been mentioned. He had brought, for the inspection of the meeting, some specimens of young pearl oysters, some of which were brought over by Sir Emerson Tennant, and others were sent to Mr. Markham by Captain Phipps. He had also brought a section of a pearl, which he had prepared in order to ascertain what the real cause of the pearl formation was; and he found, by microscopic observation, there was an animal organism, and he should say—though it was difficult to make out these minute things, in consequence of some of the parts having been destroyed or lost—that the formation was of the nature described in his report, quoted by Mr. Markham, and which he thought would receive the general assent of zoologists. As a visitor this evening, he would express his thanks to Mr. Markham for the interesting account, historical, practical, and scientific, which he had given of this subject. He was quite satisfied, from what he knew of Mr. Markham, it was his modesty only which prompted his disclaimer of scientific knowledge, which he (Mr. Jeffreys) so well knew he possessed.

Mr. TRACY mentioned that, being engaged in the working of mother-of-pearl shells some years ago, he obtained two or three real pearls from a shell, in which they were imbedded just below the inner surface. These had been found in a China shell, which yielded mother-of-pearl of purer quality than the Bombay shells, the latter being generally dark about the edges. The pearls which he found in the way he mentioned were perfectly formed, about the size of tare seed, and of an oval shape.

Mr. WRIGHT said, although he was not able to give any information on the subject of pearls proper, he would, with the permission of the meeting, offer one or

two remarks upon a product which was of greater commercial importance in this country, viz., the mother-of-pearl. The greatly increased use of that article in various branches of manufacture—more particularly of an ornamental character—had doubled the price of it during the last twelve months. The quantity of pearl shells imported into this country varied in value from £40,000 to £100,000 per annum. The most valuable shells for manufacturing purposes were found at the Arru Islands, which he had before referred to. According to the growth they varied in size, from as large as the palm of the hand to the crown of a hat. Last year there were fished 130 tons of shells from that locality. The value had now risen from about £7 per cwt. to £13 or £15 per cwt., in consequence of the great demand for mother-of-pearl articles in France and America, as well as in England. The fishery next in importance was that on the Sooloo Islands; the shells being distinguished by the yellow colour of the border and back, which rendered them unfit for ornamental manufactures, but they were principally used in Sheffield for knife handles and other purposes of cutlery. The shells which ranked next in commercial value were those known as the Bombay shells, which in reality came from the Persian Gulf fisheries; large quantities of them had lately been transported to this country by the overland route. The next important fishery was that in the Red Sea. The shells were sent to Alexandria; and since the railway had been opened from Trieste to Vienna nearly the whole of the produce of that fishery had gone to the latter city, affording employment to a large number of Viennese artisans, who manufactured for the American market, and had displaced the manufacturers of this country in that market to the extent of 50 per cent. Some years ago, between 4,000 and 5,000 persons in Birmingham found employment in the mother-of-pearl manufacture, but not half that number were now engaged in it. Since the great rise in the price of the shells had taken place, a very large proportion of the Red Sea produce was sent direct to London, and at the present moment there was probably a larger stock of Red Sea pearl shells in London and Liverpool than had been known for the last eight or ten years. The two other fisheries of note were that in the Gulf of Panama, called the Pearl Islands, and that in the Gulf of Mexico, from both of which large quantities of shells were annually obtained. It would seem that the temptation of the present high prices had led to these fisheries being worked to a greater extent than a due regard to future supplies warranted. The Americans had gone so far as to announce the formation of a mother-of-pearl fishery company, the operations of which were to be carried on by means of submerged vessels, but whether or not these would answer was still to be ascertained. Some years ago there was a pearl fishery in the Low Archipelago. The shells differed from all others in having a deep dark tone, iridescent, but not what was commercially known as black pearl, which was in fashion eight or ten years ago, but had now gone entirely out of demand. The price of these shells thirty years ago was only nominal, and large quantities of them were disposed of in Birmingham by burying them in the earth; but, upon the demand for them arising, many instances occurred in which they were dug up again and used. He hoped that these observations would be of some interest to the meeting, as the mother-of-pearl afforded employment to a large number of persons in this and other countries. He should be glad if Mr. Markham and other gentlemen would turn their attention to the obtaining of larger supplies for this country of the valuable shells from New Guinea and the Sooloo Archipelago. He stated, in conclusion, that the mother-of-pearl obtained from Ceylon was entirely useless for commercial purposes in this country.

Mr. J. H. MACKENZIE would be glad to hear from Mr. Markham whether there was any good reason why the production of the pearl oyster should not be more developed on our own coasts. He had been informed by

a friend that in some of the deeper lakes in Scotland a very profitable trade in pearl oysters had been carried on for several years. He believed that the cultivation of the pearl oyster could, with skill and care, be successfully carried on in our own latitude. The pearl itself was so beautiful a gem, that although the interests of a few dealers might be affected by a larger supply being obtained, it was desirable it should be placed, if possible, more within the reach of the community generally. He thought the development of the culture of the pearl oyster on our coasts was a subject worthy of the attention of this Society.

The CHAIRMAN, in closing the discussion, said he had seen a good deal at different times of the pearl mussel, from which the Scotch pearl was obtained. He had also seen instances of what were termed the false pearls in the shells of those mussels, but they were never of any great beauty. He had no doubt some gentlemen present had seen or heard of the pearls which were brought by Mr. Fortune, from China, where they got a large pearl mussel, and put into it several little bronze images of Bhudda, which became coated over with the pearly excretion, although they did not partake of the character of true pearls. Mr. Mackenzie had spoken of the Scotch pearls as an industry worthy of being cultivated, with a view to increasing the production of that gem in Great Britain. When fishing in the Highlands last year, he (Mr. Wilson) met with an individual who styled himself the Prince of Wales's pearl fisher, and who wore a silver badge in his bonnet, said to have been presented to him by the Prince. Whatever his claims might be to that distinction, he proved himself to be a well-informed and intelligent man, and on the subject of pearl fishery displayed an amount of knowledge which would have been interesting in the lecture-room. He (the Chairman) had brought with him a pair of Scotch pearl shells, which were given him by the person to whom he alluded, and which had, externally, every indication of containing valuable pearls; indeed, that pearl fisher informed him that he would have given £2 for the shells when first taken out of the water on the chance of the pearls they might contain. Some of the Scotch pearls he thought possessed greater beauty than many people supposed; and he would offer for the inspection of the meeting some fine specimens he had himself procured in that country. With regard to what had fallen from Mr. Mackenzie, he was bound to say his friend the Highland pearl fisher took an opposite view as to the probable remunerative character of the Scotch pearl fishery. He stated that he had exercised his vocation in his boat for many years, but, unfortunately for him, the people on the banks of the rivers, who constructed a cheap description of boat for themselves, over-dredged the rivers, and rendered his occupation a very unremunerative one. The chairman concluded by moving a vote of thanks to Mr. Markham for his very interesting and able paper.

The vote of thanks was passed, and briefly acknowledged by Mr. Markham.

Proceedings of Institutions.

BANK OF ENGLAND LIBRARY AND LITERARY ASSOCIATION.—In the seventeenth annual report, just issued, the Committee, though rejoicing in its continued prosperity, regret that they cannot offer to the members such unmixed congratulations as they have been enabled to on former occasions, but have the painful duty of referring to the loss the Association has sustained in the death of its President, William Miller, Esq., who, though the term of his presidency was but short, yet gave great proofs of his interest in the association, and his desire to promote its welfare. The association has also lost another warm friend by the death of Mrs. Thwaytes, who

gave liberal donations to the funds. The number of members now on the roll, including 9 life members, is 507, being an increase of 12 over the number reported last year; and the library now contains 11,206 vols.; 356 of which have been added during the year. Several donations have been received, especially one of £25 from Mrs. Thwaytes, and a large number of books from various donors. The Committee, in compliance with the very generally expressed wishes of the members, have abolished library fines except those levied on engaged books. The financial statement shows that the receipts have been £305 12s. 3d., and that there is a balance in hand of £17 15s.

WESTMINSTER WORKING MEN'S CLUB.—The sixth annual meeting of this club took place on Thursday, the 13th December last. Sir R. W. Carden presided, and was supported by Judge Payne, the Revs. Canon Conway, J. Wright, and Samuel Minton; W. Delpratt, Esq., Mr. G. Blaby, &c., with the working men's committee, and the members of the singing class. There were also present Lady Filmer, Mrs. Cooper, Miss Adeline Cooper, and other friends. It appeared by the report that in December, 1860, the first club-room was opened in Duck-lane; it was enlarged by the addition of another room in December, 1861, was again enlarged and remodelled in November, 1863, and the premises being required for the Westminster Improvements, the club and its various societies were transferred to the present locality in April last, this being the sixth anniversary meeting. The Penny Bank is open three times a week, secretary, Mr. Thomas Griffith—deposits during the year, £89 2s. 4d.; withdrawn, £99 12s.; balance in hands of treasurer, £10 2s. The Labour Loan Society, enrolled according to Act of Parliament, meets every Wednesday evening; secretary, Mr. Andrew Glynn. There are 39 members; capital, £155 19s. 11½d.; amount of loans, £224; balance in hand, £20 11s. 9½d. The Temperance Committee meet every Monday evening; secretary, Mr. John Byland. The public temperance meetings are held on alternate Tuesdays; a sick fund is connected with the society, formed by a subscription of 1d. per week, which entitles a member of thirteen weeks' standing to 5s. a week for a month, in case of sickness. 368 pledges have been taken during the year; income of the society, £8 16s. 6d.; expenditure, £10 12s. 10d.; balance in hand, £5 16s. 1d. The barrow club is conducted on Monday evenings. A barrow, price 55s., is furnished to a member who pays 1s. a week for the hire of it, and at the end of fifty-five weeks it becomes his own property. Five barrows were supplied last year, and twenty-five barrows since the formation of the society. The co-operative society committee also meet on Monday evenings; secretary, Mr. James Peachey. The members first assembled to form the society on the 1st of December, 1865, when sixty-seven shares were taken up. The shop was opened on the 6th of July, and business was commenced with a capital of £30; the takings of the store during the first three months were £322; total income to the present time, £563; expenditure, £556; present capital, £40. Number of shareholders, thirty-two; number of paid up shares at 5s. each, 160; donations, £13 19s. 2d. The Bible-class continues to be conducted by W. Delpratt, Esq., but the educational classes could not be continued for want of some voluntary aid. Through the kindness of W. H. Allan, Esq., a chess club has been formed; it numbers thirty-two members, and is in a very efficient state. A donation of £2 had been received from the Earl of Shaftesbury, for books for the library, also gifts of books and three pictures from J. B. Harrison, Esq. Thirteen lectures, illustrated with diagrams, models, and experiments had been delivered and much appreciated, and three special meetings held. Admirable addresses were then delivered by the chairman, by the Rev. Canon Conway, the Rev. J. Wright, and Joseph Payne, Esq. A feature of the evening was the unveiling of a portrait of the Earl of

Shaftesbury, painted expressly for the club, to which it is presented by J. B. Harrison, Esq., as a mark of his interest in the progress of the club, and a tribute of esteem for the noble Earl. A vote of thanks to the chairman was passed, and the meeting concluded with "God Save the Queen" and the Benediction.

PARIS UNIVERSAL EXHIBITION.

The Imperial commission has apparently decided on a complete change in the exterior decoration of the building. The colouring in panels in dark reds and bronzes seems to have been given up, and a uniform metallic painting adopted; it has rather too much the appearance of being black-leaded, but perhaps the effect is better than that of any of the previous attempts at decoration. The iron walls are being enlivened by the erection of large flag-staffs on the great pillars, the staff being several feet down on the face of the pillar, which is capped with a voluted ornament in zinc gilt; on the shaft of the staff is a decorated shield. The experiments with these staves afford another valuable lesson in decoration. The first staff put up was of plain wood, or painted the colour of yellow pine, varnished, and at the lower end was a gilt knob; this, being placed against the face of one of the square wrought pillars, had an admirable effect, while the floating pennant drew off the observer as it were from the iron ship-like sides of the building. The flag-staves have since been painted in bright colours, spirally, and instead of harmonising with or decorating the building, they stand out like barbers' poles, and challenge criticism. The word staff hardly represents the thing itself, which is more like a small mast; the knob is certainly nearly two feet in diameter, and the ornamental cap placed on the top of the pillar is at least four feet wide, but then, it must be remembered that the pillars are about a hundred feet high.

Great activity is displayed in the unloading of goods, and the great machine gallery no longer presents the empty appearance that it did a month ago. The three steam cranes are doing excellent service in this section, and it is to be regretted that permission was not given by the French authorities for the working of Messrs. Aveling and Porter's traction engine, which was brought over for the purpose of conveying the heavy machinery into the building. There are now in place Messrs. R. Stephenson and Co.'s inside-cylinder passenger engine, a small tank engine by Hughes and Co., a goods engine by Kitson and Co., of Leeds, and a passenger engine by the Lilleshall Company, of Shifnal, Shropshire.

The heavy machine tools by De Bergue and Co.; Whitworth; Sharp, Stewart and Co., who, among other things, exhibit a lathe for turning railway wheels; Shepherd, Hill and Co.; and Worssam's wood-working machines are now in place.

Shand and Mason's steam fire engines, "La Seine," and "La Rhône," have also arrived.

Some fine specimens of iron are being unpacked in Class 40, sent in by the Earl of Dudley and the Bowling Iron Company.

The English agricultural implements are being placed in a well-lighted shed, situated near the railway station at the north-western corner of the park. Amongst the machinery that has been unpacked and in place, may be noticed a "Royal Patent Harvester," by Hornsby and Sons, Grantham; Fowler's steam plough; some ploughs by Ransomes and Sims, of Ipswich; and Richmond and Chandler's chaff-cutters. In the park the English are making great progress with their buildings. The trussed wooden girders to carry the roof of the boiler-house are now being raised into place, on the top of 56 ornamental terra-cotta columns. The boilers have been tested by the French engineers. They consist of three forty-horse Galloway boilers; a thirty-horse water-tube boiler, by Howard, of Bedford; a water-tube boiler by Hayward

and Tyler, of London; an arrangement for heating the feed water is also in place.

The English cottage is also well advanced, and promises to be an important addition to the park. Experiments in heating, lighting, and ventilation will constantly be carried on in it during the exhibition. Upwards of 140 manufacturers have contributed towards its construction with material and fittings. The roof is covered with a great variety of different kinds of slate and tiles.

The shed for the exhibition of the government war material is about 80 feet in length by 65 feet in breadth, and the guns, &c., are now being unloaded by some non-commissioned officers of the Royal Artillery, assisted by a working party of French artillerymen. A coil, weighing 18 tons 12 cwt. 3 qrs. has already been placed. A gun, weighing 24 tons, is also being unloaded.

Another shed, covering about the same area, for the exhibition of war material by private exhibitors, amongst whom Whitworth and Armstrong, and John Brown, who exhibit some heavy armour plates that have just arrived, occupy the principal space, is not quite finished, but judging from the activity displayed by every one connected with the exhibition, it will no doubt be ready to receive the guns, &c., in three or four days.

A timber lighthouse, upwards of 150 feet in height, is now well advanced, and will soon form a prominent feature in the ground, rivalling in height that constructed by the French lighthouse board, of wrought and plate iron. The French lighthouse is 177 feet in height, and weighs upwards of 380 tons; it was designed by M. Rigolet.

The barrack hut is now ready to receive the various fittings and furniture.

In the French department a great deal of machinery is being fixed. A 4-ton steam crane, by J. Chretien, of Paris, is working most satisfactorily. A cylinder, of great length of stroke, is placed in the jib of the crane, and the chain is connected directly with the piston-rod, and passes over pulleys, arranged in such a manner that the weight is lifted to a height of four times the stroke. Four locomotive engines are already in place, the first that arrived was one constructed by the well-known firm of Parent, Schaken, Cail and Co., of Fidas-Lille, for the heavy goods traffic on the Northern of France Railway, and as to quality of workmanship, it will bear comparison with any of our English makers. It is an eight-wheeled, coupled, outside-cylinder goods engine; and weighs, when in working order, upwards of 44 tons. The next are a ten-wheeled, coupled, outside-cylinder goods engine, for the Orleans Railway, weighing, when loaded, about 55 tons; a six-wheeled engine, by the same company, and a four-wheeled, coupled, outside cylinder engine, that has been constructed by the firm De Grafenstaden. The engines for the Mont Cenis Railway, constructing by M. Gonin, of Paris, together with the railway carriages, being made by Messrs. Chevalier, Cheilus and Co., of Paris, are also to be exhibited, but have not yet arrived. Several railway carriages and waggons, for the Eastern Railway, with a brake-van, fitted with Achard's electric brake, are also in place. The horizontal engines, by Duvergier, of Lyons; Boyer, of Lille, &c., are ready for working. Mazaline, of Havre, is fixing a good many machine tools.

The "Steyerdorf," the ten-wheeled articulated tank engine, designed by M. Haswell for the Austrian State Railway, that was exhibited in 1862 in London, has arrived, and will be exhibited here. M. Hartmann, of Chemnitz, is fixing several lathes, drilling, and slotting machines of excellent workmanship.

Cail, Halot, and Co., of Brussels, are exhibiting a good deal of machinery in the Belgian section, amongst which may be mentioned some sugar mill apparatus. Two cast-steel guns, from Krupps, of Essen, are being placed in the Prussian section of the great machinery gallery.

Some of the Saxon printing machines may be mentioned for their excellent workmanship and finish.

Three railway carriages, exhibited by the Berlin Joint Stock Company, are also in place.

The Imperial commission has decided on the exclusion of the public from the present moment, and has thus given satisfaction to an almost universal demand. Now that the time is so short, it is quite clear that no one but those engaged in, or otherwise connected with, the preparations should be admitted.

The yacht and pleasure boat department has grown to so much importance, that the nautical class has been sub-divided, and we have now Class 66 *bis*, or 66A, as we should say, *navigation de plaisance*. The sheds for the yachts, boats, and models, by the side of the Seine, are ready, and will soon contain an interesting collection. Twenty-seven officers and sailors, from Brest, will be attached to the station, the detachment to consist of a master gunner, a second sailing master, two quarter-masters, four carpenters, and ten picked able seamen. An officer and six sailors will attend to the management of the salt-water aquarium, and two non-commissioned officers and a sailor to the exhibition of a life-boat. The Empress, Prince Napoleon, and Mustapha Pacha are contributors to the collection of yachts and pleasure boats.

The weather has undergone another change which is not favourable to the progress of works out of doors, but the various operations in the park are being pushed on with all possible dispatch.

The horticultural garden may almost be said to be complete, that is to say, nearly all the iron and other heavy work is done; the glazing of the conservatories will not occupy very long, and the filling of the houses with plants is only the work of a few days, as those that are to be shown are carefully kept elsewhere till wanted. The same may also be said of the shrubberies and flower-beds, and M. Barillet Deschamps, the gardener of the city of Paris, and his five hundred men will soon make the parterres brilliant with flowers and foliage. They are now busy planting the shrubs.

The French fine art admission juries have done their work, and the result is the admission of 550 oil-paintings, 102 statues, 40 busts in marble, or terra-cotta, 83 frames of engraving, 23 of lithography, and 28 of architecture.

The jury for the admission of objects of art for the retrospective gallery is now appointed; it is divided into five sections. The first, which includes works of the ante-historic period, consists of M. Larbet, of the Saint Germain Museum Commission, president, and MM. Bertrand, Colomb, Desnoyers, Vachere de Reffey, the Marquis de Vibraye, and G. de Mortillet, secretary. The second section, that of sculpture, consists of M. Longperier, president, MM. Barbet de Jouy, Barthelemy, Chabouillet, E. Fould, B. de Monville, C. Oppermann, De Saulcy, and Henri de Longperier, secretary. The third section, painting, Baron Alphonse de Rothschild, president, MM. Ph. Burty, L. Delisle, A. Firmin Didot, E. Galichon, F. Reiset, Baron James Ed. Rothschild, and J. de Laborde, secretary. Section the fourth, goldsmiths and jewellers' work, arms, locks, metal utensils, &c., the Marquis Leon de Laborde, president, Count d'Armaillé, E. de Beaumont, Prince Czartoryski, E. Dutuit, Jules Labarte, Col. Pinguilly l'Haridon, Baron Jerome Pichon, Baron Gustave de Rothschild, Count de Saint Seine, and F. Seillière, secretary. The fifth section, furniture, glass, china, &c., consists of M. du Sommerard (of Cluny museum), president, G. Aigoin, A. de Basilewski, Ch. Davillier, Leopold Double, Dreyfus, E. Guichard, the Marquis of Hertford, L. Leroux, Maillet-Duboulay, Count de Nollivos, d'Yvon, and Albert Jacquemart, secretary. M. Alfred Darcel, of the museum of the Louvre, secretary of the special commission for this branch of the exhibition, acts as general secretary for the juries.

The accounts from foreign countries promise well for the prospects of the exhibition. The Commercial Council of Brussels has just voted a sum of 5,000 francs in aid of a fund for enabling Belgian workmen to visit the exhibition.

The *Gard* steamer has brought 60 cases containing a portion of the objects to be exhibited by the Pacha of Egypt; on its last voyage the *Gard* brought 43 immense cases of wood-work for the Egyptian buildings in the park.

The new Taikoun of Japan has decided, it is said, to send his brother to represent him at the exhibition.

AGRA EXHIBITION.

The Exhibition of Works of Art and Industry made by a committee representing the North-West Provinces of India, has recently taken place at Agra with great success (a notice of the objects likely to be exhibited, was lately given in the *Journal*, see p. 181). It seems to have excited much interest among both the natives and the British. It remained open from Monday, the 4th February, to the Saturday following. Prizes were awarded by jurors, but the list was not dispatched by the last Indian mail. It was opened, in state, by the Lieutenant-Governor, Mr. Drummond.

The following was the speech of the President of the Central Committee, Mr. Thornhill:—

"HONORABLE SIR,—The Central Committee, to whom you entrusted the arrangements for carrying into effect your desire that a general exhibition of the Agricultural and Industrial products of the North-West Provinces should be held at this place, beg now to lay before you a brief report of their proceedings, by which they trust that your wishes will have been realized.

"2. Your Committee's first attention was directed to the adoption of measures for the adequate representation of the existing condition and resources of every district under your Honour's government, but they felt that the advantage afforded to producers, by the present opportunity, of comparing themselves with their fellow-countrymen in these provinces, would be greatly enhanced if the production of this part of the country could be shown in juxtaposition with those not only of other Provinces of Hindoostan and of the more distant Indian possessions of the British Government, but also with those of other Eastern countries, whose arts and manufactures have, until recently, been little known, and which will probably be seen for the first time by the majority of those who will visit this building.

"3. That your Committee have been able to bring together so varied, so interesting, and so valuable a collection of the products of the industry of China, of Japan, of Java, of Burmah, and of Singapore, and exhibit them with those of our Indian empire, is due entirely to the hearty and ready co-operation of all those whose aid they solicited.

"4. It is not less a duty than a gratification to acknowledge thus publicly their obligations, and the Committee desire to take this opportunity of bringing prominently to your Honour's notice the names of those to whom this Exhibition is more especially indebted for whatever measure of success it may be held to have achieved.

"5. For the spacious building in which we now are assembled, and in which so much that is rare and costly is displayed, we are indebted to the fertility of resource and ingenuity of one of our members, Mr. George Sibley, the chief engineer of the East Indian Railway, and to the courtesy and liberality of the Board of Agency of the Company, who placed the materials of which the structure is composed temporarily at our disposal.

"6. The exterior architectural embellishments, and the internal decorations, are the work of Lieutenant Cole, of the Royal Engineers, to whose artistic skill and cultivated taste the building is indebted for whatever ornamental character it possesses.

"7. It would be superfluous to praise that which must commend itself to all, but the Committee cannot refrain from congratulating themselves upon having been enabled to entrust this important department to an officer so eminently qualified to introduce into this coun-

try a decorative art, which as yet is so little known amongst us.

"8. Skilful ornamentation has not, however, been confined to the buildings alone—the garden, which is now blooming in what was a barren and apparently hopeless waste but a few weeks ago, and the ornamental band stand, attest the skill and energy of Colonel Rowlatt, to whom the sole credit of this metamorphosis, as well as of the orchestral arrangements, is due.

"9. To the Government of Bombay, the Committee are indebted for their large and valuable collection of the interesting objects exhibited from that Presidency, which was presented to this Exhibition at a cost of 10,000 rupees.

"10. This liberal gift was enhanced by the nomination of Dr. Birdwood to superintend the selection; and the care and judgment shown by that officer, not less than the great personal interest he has evinced, has rendered the Bombay contribution one of the most attractive in the building.

"11. The Committee are under a great obligation to the Honourable Mr. Justice Phear, who, during a visit to China, selected and brought to Calcutta the many specimens of the arts and manufactures of that country which are now exhibited.

"12. Mr. Temple, the Chief Commissioner of the Central Provinces, has not only forwarded a rich and most interesting collection of the products of his territory, but has also permitted his own series of water-colour drawings, illustrative of the physical aspect of the country, to be exhibited in the building appropriated to the Fine Arts.

"13. The Committee have also to acknowledge Mr. Temple's courtesy in deputing Lieutenant Trevor, the secretary of the recent Jubbulpore Exhibition, to convey his contributions to Agra.

"14. The Committee are under very great obligations to Mr. Dowleams.

"15. This gentleman has not only obtained for them many contributions from Ceylon, Japan, and Singapore, and rendered every assistance in receiving and transmitting consignments intended for the Exhibition, but he has also afforded the Committee the benefit of his large and varied experience.

"16. His suggestions and advice have, on many points, been invaluable, and the Committee have to regret that his important duties, in connexion with the Paris Exhibition, prevent Mr. Dowleams from being here to-day to witness the close of the labours which he has done so much to lighten.

"17. The Committee has also to tender their acknowledgment of the assistance they have received from

"The Hon. Colonel Macpherson, of Singapore.

"Mr. W. Morgan, to whom they are indebted for the Javanese collection.

"Captain J. O. Mayne, of the Royal Engineers, by whom the specimens were selected from.

"Captain Prothers, Secretary to the Government of the Straits Settlement.

"Dr. Hunter, of Madras; Colonel Barrow, Lucknow; Major Paske, Goozerat; Major Lewin, Umritsur; Captains Beynon and Walter, of the Rajpootana Agency.

"18. The services of residents of these provinces and of the Local Committees will be duly acknowledged in the detailed report which the Central Committee will hereafter submit.

"19. The Committee would, however, except Rajah Sir Dinker Rao, whose liberal expenditure from his own resources, and great personal efforts to contribute to the class of the exhibitors, deserve special notice.

"20. But whatever assistance has been rendered in enabling the Committee to bring together such large contributions from every quarter, would have failed to enable them to carry out the chief end and aim of the Exhibition had it not been for the ceaseless labours of

the curators, by whom all the arrangements have been made for the suitable reception, classification, and exhibition of all the many objects which are here displayed.

"21. Without such arrangement and classification, the Exhibition might have afforded some amusement, but would have failed to accomplish its higher object of instruction and improvement.

"22. Those who see only the results which have been attained may find it difficult to realise the great, and latterly the almost incessant, exertions which were necessary to accomplish all that has been done.

"23. How great and incessant these labours have been, is best attested by the facts that, for the past few days, they have been continued night and day.

"24. The Central Committee desire therefore to bring the services of the Curators, Colonel Rowlatt, Dr. Playfair, Mr. James Simson, Dr. Moir, Lieutenant Cole, and Mr. Webb and Mr. Adam, most emphatically to your Honour's notice, and would direct special attention to the production of the printed catalogue almost simultaneous with the opening of the Exhibition, as a proof of the excellent system and organization which has characterised their proceedings.

"25. Lastly, the Committee commend to your Honour's notice the Secretaries, Messrs. Pollock and Plowden.

"26. Upon Mr. Pollock, as the Local Executive Officer, the main burden and responsibility of this undertaking has fallen; and the Committee feel that they do not exaggerate the value of his services when they attribute to him the chief merit of whatever success has been achieved.

"27. Mr. Pollock, however, on his own part, and on that of the Curators, desires to acknowledge the great indefatigable exertions of Mr. Robinson, who has been their Executive Officer from the commencement, and to whose energy and unremitting labour they attribute in a great measure the rapid progress which has been effected.

"28. I have now, on behalf of the Central Committee, to request that your Honour will announce that this Exhibition is opened to the public."

The Lieutenant-Governor replied in the following terms:—

"Mr. President and Gentlemen of the Committee.—It is with no ordinary feelings of pleasure and satisfaction that I receive the Address you have now presented to me.

"I heartily thank you, Sir, and all those associated with you, for the very able manner in which you have so far carried out the wishes of the Government.

"I shall avail myself of a future opportunity to express my sense of the obligation under which the gentlemen whose names you have just read have laid the government of these provinces. It will suffice to say now, that I cannot too highly commend the public-spirited exertions of those to whom we are indebted for a display of taste, energy, and skill, such as Northern India has rarely, if ever, seen equalled, even in the most brilliant periods of the past.

"Agra, indeed, in the present season, may be said to have resuscitated her ancient glories. The pomp and pageant of the Great Durbar are still fresh in the memory of many of us, but we have here a more interesting, if not so imposing a demonstration, for here, instead of the pomp of courts and the impressive display of military power, we have the most effective evidence of the benefits of civilisation, and of the triumphs of industry, of science, and of art, placed side by side with the raw material from which those wonders are produced, and to which courts owe their magnificence, and for which armies are maintained.

"And here I may say a few words as to what are the objects of these exhibitions:—

"They not are intended to be mere ephemeral shows, to amuse and gratify the eye. Broadly, I may say, they

are meant to stir up the community, and to teach it that there may be something in heaven and earth beyond the narrow limits of their present philosophy.

"Their usefulness is freely admitted in England and in Europe; and Mr. Laing, when administering the finances of this country, laid much stress upon the importance of forming Agricultural Associations in this country also, as a valuable aid to social progress. Fully concurring in that opinion, it has ever been an object with me to promote them, though I wished, as far as possible, rather to foster independent action, irrespective of the government, persuaded as I am that it is only when taken up by the people themselves that such things can prove really and permanently useful.

"In the fulfilment of this wish, however, I have been disappointed, and eventually I determined upon the present exhibition as promising to afford a useful stimulus and guide to those local efforts, which have already been made in several directions, notably in Rohilcund, under the judicious guidance of my friend Mr. Inglis, with very fair measure of success, and to which we must chiefly look for practical improvement of the country. Another special object which I had more immediately in view in selecting Agra as the scene of this exhibition was that of interesting the chiefs of Central India, Rajpootana, and Bundelcund, in common with the chiefs and gentry of our own territories in the general progress of improvement and the development of the resources of their own states, and I am very grateful for the ready response which our invitations have received from many influential quarters.

"Last, but not least, among the objects of the exhibition is that of promoting cordiality of feeling and friendly association with one another of all the numerous classes—European and Native, whom I hoped to attract, and whom I am delighted to see so well represented around me this day.

"I trust these objects will be borne in mind by all whom I address to-day, and that they will endeavour, by courtesy and consideration, and free intercommunication, to assist and assure the success of this undertaking, upon which so much care and thought and labour have been expended, so that it may prove, however humble, yet no ineffective effort towards the improvement of the people and the promotion of good-will, and of the amenities of life among all classes. I now declare this Exhibition open."

THE BUDGET OF THE CITY OF PARIS.

The annual financial statement of the Prefect of the Seine is certainly a wonderful document. This year it occupies about thirty columns of the official *Moniteur*, and its totals exceed the revenues of many small states; but it must not be forgotten that the population of the department, which includes, besides Paris, the arrondissements of St. Denis and Sceaux, now exceeds two millions of souls; besides, the document deals with the accounts of three years, from 1865 to 1867, both inclusive, the first of which is not yet finally closed, and the last recently opened.

The following is the estimate for the year 1867, as given in the document in question, omitting centimes:—

Receipts.	Francs.
Ordinary	143,131,124
Extraordinary	12,394,488
Supplementary	25,000,000
Special	61,128,000
Total	241,653,612.
Expenses.	Francs.
Ordinary	96,325,791
Extraordinary	59,199,821
Supplementary	25,000,000
Special	61,128,000
Total	241,653,612.

Dividing this amount by the number of the population, 2,150,916, we obtain 112 fr. 30 c., or nearly £4 10s. per head.

The estimate for 1868 should also be published at this time, but the Prefect says that it has been delayed by circumstances, and adds:—"In your next session you will be called upon to decide on a financial situation of complete equilibrium, and you will no longer have to accept a budget, of which, in spite of all endeavours, a balance could only be established at the expense of the future."

The increase in the number of apartments is said to be in exact proportion with that of the population, the former amounting, during the last five years, to 55,127, and the latter to 132,139. Since 1852 the demolitions are given as 19,030, and the constructions as 80,055.

The following are principal items of expenditure as estimated for 1867:—

	Francs.
Annual charge on the municipal debt	18,658,696
Administration of the Prefecture of the Seine	63,709,481
Prefecture of Police	13,957,614

The above charge on the debt is upwards of two millions more than in 1866, and more than three millions in excess of that of 1865.

The sum set down for the administration of the Seine includes the following items:—

	Francs.
Public roads and paths	17,100,409
Of which the maintenance alone absorbs	8,352,500
Lighting	4,298,709
Cleansing	3,733,500
Waterworks and sewers	3,152,560
Promenades and plantations	3,247,995

The number of lights are to be increased by 1,000, making in all 31,400, of which 1,400 are oil lamps.

Amongst the items of extraordinary expenses for the coming year are:—

	Francs.
Public Charity	1,015,000
Architecture and Fine Arts	836,667
Bridges and Roads	5,165,000
Continuance of the improvement of the City	25,000,000
Improvement of Public Ways	12,000,000

The special expenditure amounts, in addition, to 61,028,000 francs, and includes, amongst other undertakings, the completion of about twenty-three miles of new roads, ordered in 1858, and of which nearly twenty miles are now open; the formation of conduits for the conveyance of 80,000 tons more water into the canal of the Ourcq, and to supply the deficiency of the canals of Saint Denis and Saint Martin in summer; the bringing of the waters of the valley of the Vauve to the new reservoir at Montsouris, eight mètres above the level of the sea, for the supply of the whole of the ancient portions of the city; the completion of two new artesian wells now under hand; the finishing of two large new churches, and the repairs of three others; the commencement of two more ecclesiastical edifices, and the alteration of several others in consequence of improvements made in their vicinity; the completion of one synagogue and the commencement of another; the finishing of the rebuilding of two mairies, the reconstruction of five others, and the enlargement of a sixth; the rebuilding of the Collège Rollin and the Collège Chaptal; the enlargement of the Ecole Turgot, and the construction of a new professional school; the finishing of ten or more other schools, which are either being rebuilt or enlarged, and of the great new barracks in the old city; the construction of a second and the enlargement of a third barrack; the erection of nine large buildings near the fortifications, for lodging the employés,

in addition to five built during the previous year; the completion of the Halles Centrales, or grand central market of Paris, and its connection with the old rotunda, in which the corn market is held; the completion of three local markets and of the great cattle market, and of the new general abattoirs in connection with it at La Villette, and of the new abattoirs for pigs; the completion of the new *parc* of the Buttes Chaumont, and the commencement of two other public gardens, one on the plateau of Montsouris, and the other on the hill of Montmartre; the completion of the immense works of the Trocadero, opposite the Champ de Mars, and of the boulevards, avenues, and plantations forming part of the plan, and of those just commenced for the transformation of the gardens of the Luxembourg, and the avenue of the Observatory. A *résumé* of the public works executed in Paris during the past year was given in the *Journal* of the 21st December last; the above extracts will show the work cut out for execution during the present twelvemonth.

The year 1867 (says the report) was that one which gave rise to the most serious considerations, first, because it formed the central year of the period of five during which the great transformations now under hand were arranged to be effected; and, secondly, because the coming of the Universal Exhibition caused many works to be hurried forward which otherwise might have been left for the years 1868 and 1869, and entailed additional expenses. The Prefect, nevertheless, expresses his conviction that the financial resources of the city will be all-sufficient, and that in 1869 the entire plan will have been carried out, and that the municipality will then be relieved from the burden which now weighs upon it.

When this time arrives (says the report) it will be necessary to consider whether the transformation of Paris shall be proceeded with—whether the surplus means of the municipality shall be applied to the reduction of taxation, or whether it would not be the wiser course to divide the funds at the disposal of the council between the two objects. For the present, or rather for the coming two years, it is the advice of the Prefect that no new works shall be undertaken, and no diminution made in the taxation of the city, in order that the municipal council may be free to take the course which may seem best at the completion of the period in question.

By way of completing the review of the resources and expenditure of the city of Paris, it may be added that the *octroi*, or city dues, amounted last year to more than ninety-two million of francs (£3,687,000), and the population within the walls being rather less than two millions, the average contribution of the whole population was nearly two pounds per head, independently of other local taxes and of those of the State. Of the above sum, all but two millions of francs consisted of *octroi* duty proper, the remainder being made up of a composition paid by the gas company, charges on transit of goods, and sundry small items. The gas company pays two centimes per cubic mètre of gas consumed in the city, and the annual consumption exceeds a hundred millions of cubic mètres. Of the *octroi* dues, wine, spirits, and other liquids pay nearly two millions sterling; eatables, upwards of six hundred thousand pounds; fuel and oil, rather less than half a million; and building and other materials nearly a quarter of a million per annum. The growth of the *octroi* account is extraordinary; in 1855 it amounted to forty-two millions of francs only, so that it has more than doubled in ten years.

Fine Arts.

NEW NATIONAL GALLERY. — The judges are unanimously of opinion that not one of the ten designs can be recommended for adoption. At the same time they

think it is due to the competitors to point to the design for a new Gallery, by Mr. Edward Barry, and that for the adaptation of the old Gallery, by Mr. Murray, as exhibiting the greatest amount of architectural merit. The report then lays down general principles that should be observed in the construction of the National Gallery, which the judges believe compatible with the architectural effect required in a great national building. A correspondence has taken place in consequence of the non-adoption of any one design. The Rt. Hon. W. Cowper, late First Commissioner of Public Works, writes that this course is unfair towards the competitors, and will establish a precedent injurious to the success of future competitions for public buildings. The ten architects have also presented a memorial, in which they state that they agreed to enter the competition on the distinct understanding that one of the competing architects would be selected for employment, and they represent that a contrary course would be a breach of faith and a lasting injury upon every one of the competitors. It appears however that the present Ministry found no written or printed record of the assumed understanding, and Lord John Manners is prepared to abide by the literal letter of the original "Instructions." Furthermore, it would seem that a distinction may be drawn between "competing designs" and "competing architects;" and the terms of the instructions, it is thought, may yet be complied with by giving to some one of the "competing architects" the actual building of the Gallery. All the ten designs, on payment of the stipulated sum of £200 a piece, become the property of the State, and may be appropriated in the preparation of the amended design which shall be finally carried out.

NATIONAL GALLERY.—The annual report of Mr. Boxall, the director, contains interesting items. No less than ten pictures have been repaired, or cleaned and varnished, of which we gave early intimation. During the year 1866 five purchases were made, at the cost of £8,160; of these the most important was the Rembrandt, on which was expended £7,000. Mr. Boxall adds valuable historic notes in elucidation of these recently-acquired works. Among donations are "The Remorse of Judas," painted and presented by Mr. Armitage, A.R.A., and a marble bust of the late William Mulready, R.A., executed by a brother academician, Mr. Weeks. Both these works were exhibited in last academy. It is recorded that the bust of Mulready was "executed at the request of a number of his friends—artists and lovers of art—in admiration of his genius as a painter, and by them presented to the nation." The pictures by the old masters, in Trafalgar-square, have been visited by 775,901 persons, and the British school at South Kensington by 756,075. It is stated that "curtains have been placed before the Turner drawings now on the walls at South Kensington, to protect them from the action of light during the time they are not publicly exhibited." The average daily attendance of students for copying has been in Trafalgar-square, 23, at South Kensington, 25. In the former gallery were made 97 copies in oil, at the latter 121. It appears that Raphael's "Garvagh Madonna," which cost £9,000, has been in greatest request; the picture has been copied nine times. The most popular pictures at Kensington are Reynolds's "Heads of Angels" and "The Age of Innocence;" the one has been copied nine times, the other seven. Dyckman's "Blind Beggar" also still continues a prime favourite; it too has been copied seven times.

Manufactures.

COAL-CUTTING BY MACHINERY.—It has been already announced in the *Journal* that the members of the South Lancashire and Cheshire Coal Association have determined on inviting competition for the best coal-cutting machine, and the committee of referees appointed by

the Association have issued the following regulations for the guidance of competitors:—1. That compressed air is the proper motive power for working coal-cutting machinery. Machinery for compressing air is already erected at several collieries in the neighbourhood of Wigan, and will be placed at the service of competitors. 2. Inventors taking a prize must be bound by the condition that no annual payment, or tonnage royalty, as patent right, shall be charged to any present or future member of the above Association, but that such member shall pay a patent right on the purchase of each machine, to include the working thereof, which patent right shall in no case exceed 50 per cent. of the cost of the machine. 3. The committee reserve power not to award any premium unless they are satisfied with the performance and capabilities of the machine or machines submitted for trial. 4. Machines furnished for trial by November 1, 1867, will be tried by the committee, who will make their award thereupon in or before the month of May, 1868. 5. The committee direct the attention of competitors to the following requirements to which the machine must be adapted:—Thickness of seams from 2ft. to 9ft.; dip, or inclination, from horizontal to an angle of 20 degrees; as to weight of machine, lightness and easiness of movement desirable; maximum size of tub or waggon used in the mines, 3ft. 6in. by 3ft., and 3ft. in height; gauge of road, from 1ft. 6in. to 2ft. 3in.

WATCHMAKING AT BESANCON.—The *Annuaire du Doubs* gives the following account of the watch trade of Besançon. During the year 1865 there were submitted to the local stamp-office 296,012 watches, of which 95,594 were in gold cases, and the rest in silver; of the total number 3,192 only were marked for exportation. The trade of Besançon was founded in 1792, and it is practically the only watch-making district in France, for during the whole of the year 1865 there were only 31 gold, and 6,495 silver watches made elsewhere in France, and of these 23 gold, and 6,340 silver were made in Paris. The total number of watches submitted to the stamp-office in 1865, including foreign as well as French, was 378,498, and of this number Besançon supplied more than 78 per cent.

Commerce.

FISH AND OYSTERS IN FRANCE.—In the exposé of the situation of the Empire, appears the following account of the supply of fish and mollusks:—In 1865 the quantity of fish sold amounted to more than £1,640,000, and the fisheries employed 15,898 boats, and 57,961 men. Comparing that year with the preceding, we find an increase of £214,493 in the value of the fish, 470 boats, and 1,665 men. There were 1,340 beds, or parks of oysters formed in 1866, and 1,956 in 1865. At the present moment there exist 37,000 parks for the deposit or rearing of oysters, independent of 18,000 oyster beds, constructed on the banks of the Seudre, covering an extent of 15,000 acres.

RIGA FLAX IN ALGERIA.—France imports, at present, a large quantity of flax seed from Riga; but the Governor-General of Algeria conceived the idea that it might be produced advantageously in that country, and commissioned M. Farnèse Favarcy, of Lille, to make trial of the matter. The first attempts, in 1865, were not successful. The wrong kind of seed seems to have been selected, and, moreover, the season was exceptionally bad. Last year the experiment was renewed in thirty different localities, in France, Belgium, Holland, and Germany, with seed grown in Algeria, and, without question, of the true Riga variety, with blue flowers, and the success is reported to have been complete. The plants have universally grown more rapidly than those produced from seed coming direct from Riga, and attained greater development, having a single stalk, good tap roots, and abundance of seed, large and shining.

The results obtained from seed sown in May, in places where late flax is cultivated, are said to have been equally satisfactory. In all instances the retting is said to have taken place in the best possible conditions by the various processes adopted in the north of France, that is to say by dew, stagnant water, running water, and the Bergnes method. The average yield of fibre was 25 per cent., which is the maximum of the best French flax; and the quality is reported to be superior to that obtained from Riga seed. The inference drawn is that Riga flax, which degenerates in France very rapidly, acquires unusual vigour in Algeria, and that when sown in the north of France as summer flax, it loses none of its primitive qualities, and that therefore the production of the seed in Algeria ought to be a profitable undertaking. But there is another and very important element to be taken into consideration, namely, price. The true Riga seed is at present cheaper than usual, but it costs, at Dunkirk, freight and insurance included, 45 to 50 francs the quintal; the Flemish seed generally fetches about 5 francs less than the Russian, and it appears that the Algerian seed may be produced at a price not exceeding that of the Flemish.

Colonies.

THE PASTORAL INTEREST IN NEW SOUTH WALES.—A Sydney paper says that the hopes of the squatters are at their highest, and that they were never in a better position than they now are. Their flocks and herds are in first-rate condition—their runs are clad in verdure, bountifully supplied with water, and they are able to get high prices for their beeves and muttons. The shearing had been concluded, though the difficulty of obtaining shearers and washers had in some parts of the country retarded operations a great deal. The yield of wool this year is very large, and the average weight of fleece is good.

STATE OF QUEENSLAND.—In the pastoral district the production of wool and the average increase in the quantity of stock exceed former years. The gold-fields are finding remunerative employment for a large number of men; copper-mining and the coal-fields are becoming more productive; and agriculture is extending, and the results obtained in the last year or two have established it in the public opinion as a profitable occupation. The imports of farm produce are being fast shut out of the market, with the exception of flour, for which the colony is still dependent upon other colonies. The growth of wheat is, however, rapidly extending. The experience of the past year has established cotton in the neighbourhood of Ipswich and in some other districts—another successful year will have the same effect all over this portion of the colony. A large amount of capital has been invested in sugar-growing, with every prospect of success, for that the cane thrives well has already been proved, and the machinery is in course of erection. The small quantities of sugar already manufactured show that experience only is required to ensure that end. On the other hand, however, in all the towns of this colony complaints are rife of the bad state of trade, and money is not to be had anywhere. The fact seems to be that the colonists have been over trading, the extent of the business operations having been out of all proportion to the population, and still more in excess of the income of the colony, annually produced from its own resources. It is unreasonable to expect that the large number of people who have landed there within the last three or four years should be able to settle down permanently in their places at once. Those who have been accustomed to the life of a farmer at home, and who, having brought with them some little means, have gone into the country and settled on their own land, are almost invariably doing well. But the majority of

those arriving in the colony have preferred a town life, and the extensive building operations, and other improvements going on, have enabled them to find employment without going into the country. Immigration has ceased for a time, financial difficulties have stopped improvements to a great extent, and everything connected with the building trade is in a state of stagnation, numbers of tradesmen and labourers being thrown out of work.

WHEAT FROM VICTORIA.—A Melbourne paper says that although experimental shipments of wheat have been made to London from the colony of South Australia, this is the first season in which the business has been entered into upon a large scale, either from this colony or from the one before mentioned. One ship in Hobson's Bay had 600 tons of wheat on board for Great Britain, and other considerable parcels have been bought for that market. As high as 5s. 6d. per bushel has been paid for wheat for export, and the success of these shipments will be watched with much interest. Heretofore, the neighbouring colony has found a ready market for its surplus produce in Victoria, but in future the latter is likely to grow enough for itself.

Obituary.

THE DEAN OF HEREFORD.—The Very Rev. Richard Dawes, Dean of Hereford, died at the deanery, on Sunday, the 10th inst., after a long illness. The late Dean was born in the North Riding of Yorkshire, in 1797, and educated at the school of Mr. Rolfe, near Kendal. It was here that Mr. Dawes first met Whewell, who was three years his senior—a difference of age which permitted the former companions at school to stand in the relations of tutor and pupil at Trinity College, Cambridge. Mr. Dawes was fourth wrangler of his year (B.A., 1817; M.A., 1820), and was shortly afterwards elected fellow and mathematical tutor of Downing College. In 1838 he accepted the living of King's Somborne, in Hants, which he found one of the worst, and which his conscientious diligence made one of the best parishes in the county. When he went, there was no school there, no squire to help to found one, no farmer who was not opposed to the work of popular education; but Mr. Dawes' zeal and industry supplied every want, and in a few years the King's Somborne school was pointed to far and wide as a model, and eulogised by school inspectors. An account of this school was given by the Dean in a paper read before the Society of Arts, in April, 1853, entitled, "Remarks on the importance of giving a self-supporting character, as far as possible, to Schools for the Labouring Classes, and the means of doing so."* When he accepted the deanery of Hereford, in 1850, the bishop and clergy of the diocese united to present him with a testimonial; but what pleased him even more than this mark of kindness was that the very farmers, who, in the first instance, strenuously opposed him, came to thank him for the good he had done. His exertions in the same cause were not slackened by his new position. He acted for several years as the Society's Examiner in "Domestic Economy," and always evinced the greatest interest in its proceedings, especially those having reference to education.

Publications Issued.

NATURE AND ART. (*Day and Son*).—The first volume of this periodical, which comes out monthly, is just completed. The object and scope of the periodical are very wide; they may be said to be to draw attention to all

* See *Journal*, Vol. I., p. 265.

that is interesting in nature and art. The illustrations are numerous. Wood engraving, chromo-lithography, and photo-lithography are pressed into the service.

Notes.

THE MANURE OF CITIES.—The city of Bordeaux is in a difficulty about its refuse; contractors complain of the trouble they find in getting rid of some forty thousand tons a year. The authorities, after having received considerable sums of money for the manure of the town, are at present obliged to pay about £20 a day to get rid of the mere refuse and sweepings of the streets, not including road sweepings and sewage. It seems scarcely credible, but is positively asserted, that the refuse of Bordeaux is used by the cultivators of Isle and Dordogne, at a distance of fifty or sixty miles from Bordeaux, while in the neighbourhood of the last-named place not a ton is employed. The last contractor, thinking that the proprietors of the lands would be glad to take advantage of the facilities offered by the Bayonne Railway and the rival roads for procuring manure, hired the ground belonging to the station of the Southern Railway, and there collected a mountain of refuse; nobody would have it, and it is gradually rotting away where it stands. It would naturally be supposed that the manure was not worth having, but the contrary is proved by long experience; the very same refuse is advantageously used in the neighbourhood of Perigord, although the purchasers have to pay the expense of river conveyance, which occupies fifteen days, and some other expenses. Scientific and practical men are now making great efforts to waken the agriculturists of the neighbourhood of Bordeaux to the fact that they are allowing this source of prosperity to lie unheeded at their doors.

Correspondence.

THE WATER SUPPLY OF LONDON.—SIR,—The paper upon this subject read by Mr. Beggs on the evening of the 20th Feb., shows that the views of that gentleman are perfectly correct, and is of the greater value on account of the discussion, carried on by eminent men, which followed the reading of the paper. That the supply of water to the inhabitants of the metropolis should be constant, with the mains always charged, is a question that admits of no doubt, and the various objections regarding waste and bursting are wholly untenable—that is to say, provided the supply taps be invariably fixed within the dwelling house, and not in the yard, unless under special circumstances and paid for accordingly, as the dripping or running of water taps in kitchen, chamber, or passage, would not be allowed one moment longer than necessary for the drawing of the water. In regard to the taps themselves, the high pressure stop-cocks, now in universal use, are tight and easy to turn, while the old conical plug tap is always either leaky, or too tight to turn with moderate force. The modern stop-cock can also be taken out and repaired without the assistance of the plumber. The fear of bursting has no foundation in fact, excepting in the case of severe frost, which must be provided against by never exposing either pipe or tap to the open air. It is also objected that much time will be lost when large quantities of water may be required quickly, but such is not the case, for, by turning the modern tap more or less, a tumbler or a bucketful may be drawn in the same time. In this town of Reading we have a constant supply, at high pressure, and I have frequently attached a hose and branch pipe to the tap we have in the garden, when the water has played over the roof of the house. I may also state that we have here

two separate water-works, but both belong to one company. The old works supply unfiltered water for the streets and other purposes, while the new supply the town with filtered water, also at high pressure, and the payment or rating is per tap, with unlimited supply, but with the recommendation to allow of no unnecessary waste, except watering the garden in summer. The payment by meter, often out of order, is radically bad, because by that mode we endeavour to measure large volumes of water by means of infinitesimal measurements, always a source of considerable error. The rating must, therefore, be for each tap of a certain size; and where a dwelling is let to several distinct families, then each family must be provided with its own stop-cock, but not placed, as usually the case, over a sink or waste pipe, so that the users should be compelled to keep a pail to catch the drippings, or waste, which, under such circumstances, will be little or nothing to speak of. It is objected that the change from intermittent to a constant supply will cause great expenditure and inconvenience, but such will not be found to be the fact, for the expense will be the cost of a few yards of service pipe and a new tap, when in nine cases out of ten the sale of the cistern and complicated traps will more than compensate for the trifling outlay. Some difficulty might, perhaps, be anticipated in dealing with the dwellings in the poorer districts, where each house is let in many different tenements. But here again there is ample remedy at hand—viz., those persons who let such tenements must be made responsible for any breach of the laws of health, of cleanliness, and of morality, and should not be allowed to let their tenements to many distinct families without providing water supply for each floor or flat. If, as in many cases, the real landlord cannot be discovered, there is always a ground landlord, and he can be found, fined, and imprisoned for the misconduct that he has allowed to be carried on upon his property. I cannot agree with the storage plan, for the flood waters ought to be confined by permanent embankments, and forced to scour out the beds of our rivers, instead of devastating the country, and causing so much destruction of life and property. The flood waters, loaded with impurities, would have to be rendered clear by deposit and filtration, which latter process will never be carried out in a natural and philosophical manner, until filtration is made to take place upwards instead of downwards, the latter causing the water to be filtered constantly through its own filthy deposit. With regard to the question of supply, it is only by a perversion of nature, the ignorance and misdeeds of man, that towns are prevented from making use of the rivers that flow so abundantly at their feet. Again, I assert that if all dams, weirs, and other impediments were entirely cleared away, and our rivers permanently embanked; if all ordure, noxious impurities, and contaminations, were prevented from passing into the stream, there would be no difficulty in obtaining a supply of good water, to any required amount, within half a mile of any town, and at a very small comparative cost. Rivers form the natural drain of the country through which they flow, and it is flying in the face of an all-bountiful Providence to place any check or impediment in the free course of our rivers and their tributaries, from their spring head to their outlet into the sea. The two towns which I have found to be best supplied with soft pure water, and in which no machinery whatever is used, are Cape Town (Table Bay) and the city of Rome. In both the supply is constant and unlimited. The former is supplied by a spring at the foot of Table Mountain, in quantity sufficient to turn several mills. The city of Rome, although every house and garden has a well of good water, is furnished in addition with a superabundance of fine water by means of the aqueducts still remaining. All the fountains in Rome, both public and private, play night and day all the year round; and all water not used runs away into the Tiber. The Acqua Paulina enters Rome at such a

height as to drive several flour mills in succession before it reaches the fountains. The Acqua del Ape is in the Vatican, and forms a small fountain, which supplies the Pope's palace with the purest water imaginable, and is therefore called the "Fountain of the Bee." When Queen Christina, of Sweden, was shown the well-known great fountains in the Piazza di San Pietro, she said they were very grand, but she had seen them enough, and they might be stopped now. "Please your Majesty," was the reply, "they have played for more than a hundred years, night and day continually."—I am, &c., HENRY W. REVELEY.

Reading, 27th Feb.

STORM SIGNALS.—SIR,—As your reporter appears to have misunderstood several of the observations I made on Wednesday evening, the 6th inst., I shall be obliged by your inserting the following corrections:—In the first place, the wave of barometric pressure which seemed to have travelled from Shanghai over Europe, to Montreal, in Canada, indicated a pressure at Shanghai of nearly 31 inches at Montreal, instead of 30 inches, as printed. In the next place, in illustration of great differences of pressure taking place within limited distances, I stated that on board a ship, in a cyclone, off the Malabar coast, the barometer stood at 28 inches (not 20 inches, which I suppose is a misprint), while a barometer at Ootacamund, within 100 miles, reduced to the level of the sea, stood at 30 inches, so that within 100 miles there was a difference of atmospheric pressure of two inches of mercury. In the next place, I did not say that a similar bulletin to Mons. Le Verrier's daily weather bulletin from Paris was issued in other capitals in Europe, but that storm signals, or warnings, had been practised by the celebrated Küper, of St. Petersburg, and by Mons. Bellot, of Utrecht, the latter of whom was so jealous of Admiral Fitzroy's reputation of being the first proposer of storm signals, that he has made a claim to having preceded Admiral Fitzroy in the matter. The next correction is, that I did not say that the Meteorological Committee of the Royal Society had already cost £10,200, but that the proposed cost was to be £10,200, with an outfit of £2,500. Finally, I did not say that a westerly wind came from a dry climate (a misprint, probably, for northerly and easterly), for westerly winds, particularly those with points of southing in them, bring aqueous vapour with them from the Atlantic, and the barometer falls as the dew point rises; but with winds from the north and east the barometer may be high in England with stormy winds, as I see was the case at Shanghai, in China, on the 15th January, 1867; with a strong north-east wind the barometer stood at 30·77 inches and the thermometer at 46 deg. N.B.—There is a misprint of 72 meteorological stations in Scotland for 55.—I am, &c., W. H. SYKES.

47, Albion-street, Hyde-park, 9th March, 1867.

MEETINGS FOR THE ENSUING WEEK.

- MON.....**Society of Arts, 8. Cantor Lecture. Mr. John Hullah, "On Music and Musical Instruments."
London Inst., 7. Mr. G. A. Macfarren, "On the Lyrical Drama."
Society of Engineers, 7½. Mr. H. K. Bamber, "On Water and its effects on Steam Boilers."
R. United Service Inst., 8½. Major William Palliser, "The Conversion and Rifling of Cast Iron Ordnance."
Entomological, 7.
Victoria Inst., 8. Discussion on Mr. Warington's paper, "On the Credibility of Darwinism."
- TUES ...**Civil Engineers, 8. Discussion upon Captain Tyler's paper, "On Steep Gradients and Sharp Curves on Railways;" and (time permitting) Mr. W. A. Brooks, "Memoir on the River Tyne."
Statistical, 8. Mr. W. L. Sargant, "On the Progress of Elementary Education."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Rev. G. Henslow, "On the Practical Study of Botany."

WED ...Society of Arts, 8. Mr. Harry Lobbs, "On Successful Oyster Culture."

Geological, 8. 1. Mr. W. S. Shea, "Report on recent Discoveries of Gold in New Brunswick." Communicated by the Right Hon. the Earl of Carnarvon. 2. Mr. W. Wheelwright, "On the Discovery of Coal on the Western Slope of the Andes." Communicated by Sir R. I. Murchison. 3. Rev. P. B. Brodie, "On the presence of Purbeck Beds at Brill, Buckinghamshire." 4. Mr. C. Moore, "On Abnormal Conditions of Secondary Deposits when connected with the Somersetshire and South Wales Coal Basins; and on the Age of the Sutton and Southerndown Series." 5. Mr. H. W. Bristow, "On the Lower Lias, or Lias Conglomerate of Glamorganshire." London Inst., 6½.

THUR ...Royal, 8½.

Antiquaries, 8½.
Linnean, 8. 1. M. Triana, "On *Melastomaceæ*." 2. Mr. McLachlan, "On New Genera and species of Neuropterous Insects (*Plampenna*)."
Zoological, 4.
Chemical, 8.
Numismatic, 7.
R. Society Club, 6.
Royal Inst., 3. Prof. Frankland, "On Coal Gas."

FRIRoyal Inst., 8. Dr. J. Bell Pettigrew, "On the Various Modes of Flight in relation to Aeronautics."

SATR. Inst., 3. Prof. Frankland, "On Coal Gas."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 1st March, 1867.*

28. Bills—Admiralty Jurisdiction.
43. " London Coal and Wine Duties Continuance.
44. " Lyon King of Arms (Scotland).
49. " Charitable Donations and Bequests (Ireland).
26. Revenue Departments—Accounts.
31. Army and Militia Services—Account.
71. Augmentation of Benefices—Return.
75. Societies—Return.

Delivered on 2nd March, 1867.

46. Bills—Petit Juries (Ireland).
54. " Hypothec Abolition (Scotland) (corrected copy).
57. " Railway Construction Facilities Act (1864) Amendment.
61. " Oyster and Mussel Fisheries.
46. Trade and Navigation—Accounts (31st December, 1866).
73. (r.) Railway and Canal Bills—Second Report.
85. Revenue and Population (Ireland)—Return.
87. Court of Chancery (Appeals)—Return.
Education—Minute.

Delivered on 4th March, 1867.

34. Bills—Sunday Trading.
64. " Religious, &c., Buildings (Sites).
32. Army—Statement of the Savings and Deficiencies.
53. National Debt (Savings Banks and Friendly Societies)—Account.
61. Bankruptcy Court—General Return.
81. Merchant Shipping—Account.
88. Lambeth Workhouse—Correspondence.
Metropolitan Workhouses—Report.
Miscellaneous Statistics (United Kingdom), Part VI.
Public Petitions—Fifth Report.

SESSION 1866.

422. (A VIII.) Poor Rates and Pauperism—Return (A).

Delivered on 5th March, 1867.

59. Bills—Dublin University Professorships (as amended).
60. " Municipal Corporations Charities.
83. Bunhill-fields Burial Ground—Letter.
89. Strand, Rotherhithe, and Paddington Unions—Correspondence.
90. Battersea Parish (Vestry Clerk)—Order.
100. Army—Supplementary Estimates.
Canada (Fenian Aggression)—Correspondence.

Delivered on 6th March, 1867.

46. Trade and Navigation Accounts (corrected pages).
79. Army (Sneider Breech-loading System)—Reports.
Public Petitions—Sixth Report.

SESSION 1866.

502. Start Point (Time Signals)—Return.

Delivered on 7th March, 1867.

48. Bills—Common Law Courts (Ireland).
60. " Municipal Corporations Charities (corrected copy).
62. " Factory Acts Extension.
63. " Hours of Labour Regulation.
78. (II.) Committee of Selection—Third Report.
84. Poor Law (Anglesey and Holyhead Unions)—Report.
94. Stud Shot—Report.

98. Passengers' Baggage (Paris Exhibition)—Memorials.
Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation (No. 2, 1867).

Delivered on 8th March, 1867.

50. Bills—Sea Coast Fisheries (Ireland).
65. " Game Preservation (Scotland).
43. Civil Services—Estimates.
91. New National Gallery—Report.
99. Piers and Harbours (Provisional Orders)—Report.
River Plate (No. 1, 1867)—Correspondence.

Delivered on 9th March, 1867.

66. Bills—Metropolitan Poor (as amended).
69. " Chester Courts.
28. Woods, Forests, and Land Revenues—Abstract of Accounts.
86. Corn, Grain, and Meal—Statement.
93. Metropolitan Improvements—Statement.
101. London, Chatham, and Dover Railway Company—Account.
103. Bank Notes—Return.
Public Petitions—Seventh Report.

SESSION 1866.

509. Exports, &c.—Returns.

Delivered on 11th March, 1867.

13. County Rates—Returns.
75. (i.) Societies—Return.

Delivered on 12th March, 1867.

4. Bank Notes—Return.
92. Navy (Health)—Statistical Abstract.
102. Metropolis Turnpike Roads—Forty-first Report.
108. Lieutenant Brand—Correspondence.

Patents.

From Commissioners of Patents' Journal, March 8th.

GRANTS OF PROVISIONAL PROTECTION.

Armour plates—308—J. Benson.
Atmospheric plates of artificial teeth—286—N. T. Folsom.
Barrels, tilting—411—J. Walton and R. Harlow.
Bench and desk, combined—370—T. R. Jones.
Bobbins—336—W. E. Newton.
Boxes, fastening—282—F. Ashford.
Brace fabrics—280—S. H. Foster.
Breach-loading fire-arms and cartridges—483—M. Walker, G. H. Money, and F. Little.
Breach-loading needle fire-arms and cartridges—445—G. F. Redfern.
Buildings, floors for—459—R. Moreland, jun.
Cans, &c.—437—E. Stevens.
Charcoal box smoothing irons—348—E. Siddaway.
Chimney tops—423—J. Capper.
Cinder shovels, &c.—419—K. George.
Coal, cutting, &c.—457—J. S. Walker.
Corsets—443—W. E. Newton.
Cruet frames, &c.—415—G. Ireland.
Designs in wool, producing—481—L. H. Mahon.
Drilling machines—338—A. B. Brown.
Electro-magnetic engraving machines—364—P. E. Gaiffe and A. A. Lalanne.
Engines—296—E. S. Crease.
Engines—300—D. Greig, R. Burton, and F. Parker.
Fabrics—356—E. Firth.
Fastenings—256—S. Macarthur.
Fibrous materials, spinning, &c.—431—J. Shaw.
Fibrous substances, disintegrating—477—W. Riddell.
Fire-grates and furnaces—270—A. Craig.
Fires, lighting—258—J. F. D. Donnelly.
Food for infants—250—E. V. L. Ebersburg.
Furnaces—210—J. A. Jones and R. Howson.
Furnaces—268—J. Lockwood and H. Shaw.
Gas meters—449—H. Alder.
Gas pressure governors—495—W. E. Heath.
Glass-blowing—143—W. Bull.
Gun and pistol locks—332—T. Rigby.
Hoists, &c.—310—W. J. and T. Dewhirst.
Horse shoes—318—S. L. Lucena.
Horticultural buildings—294—W. Richardson.
Hurdles, &c.—475—J. Sainty.
Infants' feeding-bottles, &c.—207—J. Nodder.
Iron and steel, uniting—469—W. B. Adams.
Iron, &c., vitrifying—322—J. Ballouhey.
Kilns and ovens—290—J. G. Robinson.
Limestone and cement, calcining—471—H. Wadkin and C. Shepherd.
Liquids, filtering—330—G. A. Waller.
Lock spindles, adjustable—455—M. Cavanagh.
Locks—306—M. Cockerell.
Lubricating apparatus—467—W. S. Gamble.
Mathematical instruments—433—G. White.
Mechanical movements—352—W. Clark.
Metal, moving, &c.—342—G. Ramsbottom.
Mines, &c., lighting—252—H. R. Fanshawe.
Needles—302—C. F. S. Wardwell.

Oakum—451—E. Brasier.
Oils, preparing—344—G. E. Pain and C. Corroy.
Paper—254—B. Hunt.
Pearls or beads, artificial—331—C. E. Brooman.
Penholders, reservoir—288—J. Darling.
Pipes, junctions of—365—W. Jones.
Power loom lathes—487—W. W. Urquhart and J. Lindsay.
Power, transmitting—248—T. C. Entwistle.
Printing machines, cylinder—427—T. W. Nicholson.
Railroad switch indicators—453—A. V. Newton.
Railway crossings—272—T. Summerson.
Railway engines and carriages—493—M. Henry.
Railway trains, signalling between passengers, guards, and drivers of—304—W. J. Baker.
Reaping and mowing machines—371—J. Brigham and R. Bickerton.
Rifles—26—F. R. Aikman.
Ships' bottoms, coating—425—J. Lambie.
Ships' pumps—266—H. Roberts.
Silk, treating—264—C. E. Brooman.
Spindles, self-oiling—298—J. G. Tongue.
Spinning frames—320—T. Craven.
Spotted threads—489—C. E. Brooman.
Stands—194—F. H. McLauchlan.
Steam generators—292—A. V. Newton.
Street gutters, &c.—417—G. W. Wright.
Traps—204—F. Stephens.
Travelling—473—J. M. Kaufmann.
Umbrellas and parasols—461—C. Weigand.
Venetian blinds—350—F. C. Leader.
Vessels, propelling—479—W. Hale.
Washing and churning machines—360—T. Sibley.
Water by atmospheric pressure, raising—274—T. and C. F. Cooke.
Water meters—429—A. V. Newton.
Weavers' harness—316—G. Haseltine.
Weaving, looms for—314—J. J. Harrison.
Window and shutter fastenings—328—D. Barr and J. Bloxham.
Wringing, &c., rollers for—421—W. J. Knowles and J. E. Wilding.
Yarn—262—G. A. J. Schott and J. S. Rosenthal.
Yarn, drying—324—J. G. Tongue.
Yarn, sizing, &c.—368—R. Haworth and J. W. Welch.
Yarns, &c., starching—340—F. Rosenauer.
Yards, twisting frames for—366—T. Gill.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Axles, self-lubricating—593—G. Haseltine.
Carding engines—542—T. B. Kay and F. Hamilton.
Heat, generating—560—S. B. Allen and J. H. Winsor.
Reflectors, adjustable—534—F. V. Wright.

PATENTS SEALED.

2326. E. Harlow.	2378. J. Twibill.
2332. T. Baldwin.	2380. P. Brash and W. Young.
2333. R. A. Harcastle.	2430. A. V. Newton.
2340. W. E. Gedge.	2432. T. A. Rochussen.
2343. J. P. Bright.	2538. J. Daniel.
2345. S. Woodall and J. M. V. Winkle.	2617. J. Warwick.
2350. E. Phillips and J. Howie.	2764. G. Davies.
2356. J. H. Betteley.	2824. W. E. Newton.
2360. A. Cairns.	3222. J. C. McDonald and J. Calverley.
2363. C. F. Varley.	3396. H. A. Dufrené.
2370. R. Couchman.	88. K. Mushet.

From Commissioners of Patents' Journal, March 12th.

PATENTS SEALED.

2353. F. G. A. Horstmann.	2417. H. Carter & G. H. Edwards.
2358. R. R. Riches & C. J. Watts.	2442. F. R. Mosley.
2359. C. H. Cheshire.	2486. J. Y. Betts.
2364. C. P. Stewart & H. Chapman.	2518. J. Gueunier-Lauriac.
2365. J. H. Johnson.	2519. P. P. J. Martin.
2367. J. Boyd, J. McPherson, T. K. Kerr and J. Taylor.	2535. M. P. Robertson.
2368. J. Bindley.	2568. W. G. Valentin and G. H. Benson.
2369. W. Tunstill.	2612. G. H. Benson and W. G. Valentin.
2372. N. Dunn.	2614. G. H. Benson and W. G. Valentin.
2374. B. Bayliss.	2616. G. H. Benson and W. G. Valentin.
2375. C. C. Connor.	2623. A. H. Brandon.
2376. W. Creasy.	2895. P. Kirk.
2377. A. B. B. V. Rathen.	3054. G. Haseltine.
2379. J. Jackson.	3337. S. and J. J. Perry.
2384. W. E. Gedge.	
2390. G. Dyson.	
2394. W. E. Gedge.	
2398. H. W. Ley.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

611. H. N. Penrice.	576. E. Cowles.
589. T. Greenwood & H. Hadley.	587. C. Brakell.
687. W. Clark.	738. W. Leuty.
571. W. E. Gedge.	

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

605. J. Howard.	650. J. H. Young.
624. A. Paget.	640. C. Sheldon.
617. R. Pitt.	